

NOVEMBER 1954

35 CENTS

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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REG. U.S. PAT. OFF.



The '55 Pontiac

1955's New Car Parade Begins — Page 88
Big Christmas Gift Section
How to Upholster With Foam Rubber

DON'T BE PUSHED AROUND THIS WINTER!



Your car will start fast with patented **FIVE-RIB CHAMPION SPARK PLUGS!**

Whatever the weather . . . just touch the starter and your full-firing Champion Spark Plugs go to work!

Champion's exclusive FIVE-RIB insulator design protects you against electrical "flash-over" due to dampness—a major cause of hard starting.

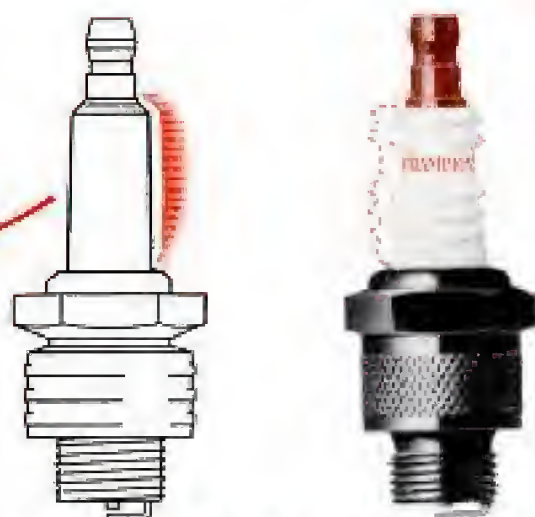
Compare a FIVE-RIB Champion with an ordinary spark plug and you'll see why.

Champion's insulating surface is greater because of its ribbed construction. Exterior electricity is diverted and spent before it can short out a damp plug. Tests prove this gives you as much as forty percent more protection than smooth insulator types under the same conditions.

Get the jump on winter now. Let your Champion dealer install a set of FIVE-RIB Champions when your car has its winter change-over.

You'll get going, and get where you're going, with Champions!

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO



INSIST ON FIVE-RIB

CHAMPIONS



**From Under The Sea
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For Your Battery**

-in the superpowered Double Eagle 125!

Now—Goodyear's completely new Double Eagle 125 battery has the same heat-, acid- and shock-resistant Microporous Rubber Separators as those used in the U. S. Navy's rugged batteries! Together with a special glass fiber insulation, these separators make Double Eagle 125 longer-lived, more efficient, too.

In fact, every part of this revolutionary battery is built for heavy

duty: There's 67% more starting stamina than standard equipment batteries — 39% greater power reserve to operate all accessories—and its new blue and yellow Polystyrene case is twice as strong as the finest rubber case!

Ask your Goodyear Dealer about this superpowered Double Eagle 125, soon. Goodyear, Battery Dept., Akron 16, Ohio.

GOODYEAR

DRY PROOF DOUBLE EAGLE BATTERY

Double Eagle—T. N. The Goodyear Tire & Rubber Company—Akron, Ohio

This One

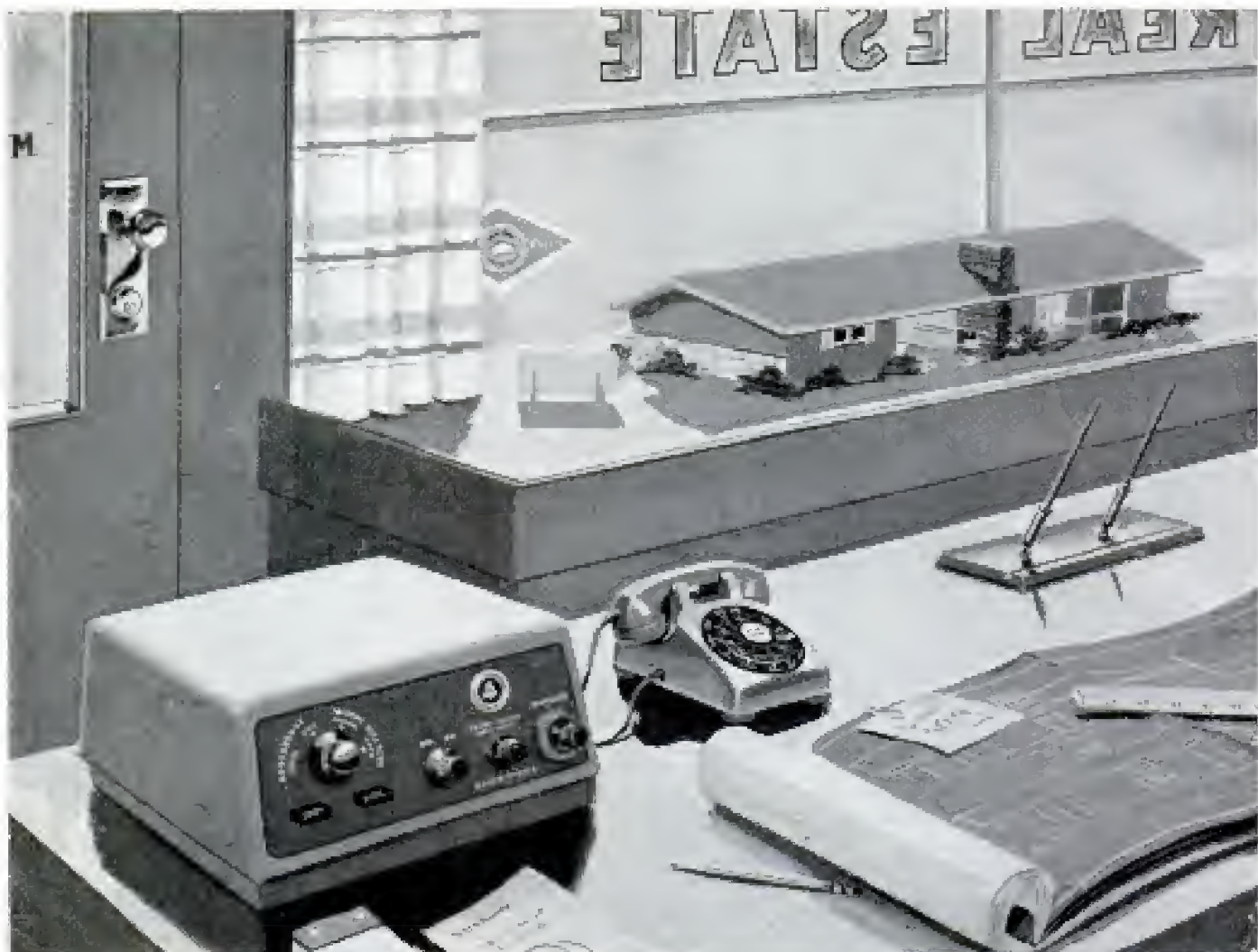


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NOVEMBER 1954

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Bell's new Telephone Answering Set. In use, the machine tells the caller when to start talking, and when his time—thirty seconds—is up.

He's out...

but he's answering his telephone!

This newly designed Bell Telephone Answering Set makes it possible for you to go out—but leave your voice behind.

Before you leave you twist a knob, dictate a message into your telephone, then switch the machine to "Automatic Answer." When somebody calls, the machine starts up and the caller hears your voice telling who you are, asking his name and telephone number, repeating what you have said. The reply is recorded too. On your return you play back all the calls that have come in, as often as you please.

The new machine features "talking rubber," a Laboratories-developed recording medium of rubber-like plastic and iron oxide which can be used over and over again millions of times. It is another example of how Bell Laboratories research works to help your local Bell Telephone Company serve you in new ways.

**Bell Telephone
Laboratories**



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careers for men in scientific and technical fields*

Popular Mechanics Magazine

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H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



Next Month

SPECTACULAR is the word for a popular national sport played with motorcycles and steep hills. Every year a large army of riders competes locally for the honor of taking part in the National Championship Hill Climb sanctioned by the American Motorcycle Association. A favorite hill to test the mettle of the best riders is near Muskegon, Mich., is as high as a 30-story building and has a 45-degree grade. Most of the riders build their own souped-up machines for this "sport of spills" in which many compete and few "go over the top." Readers are invited to come along for an exciting ride with the "Mountain Goats on Two Wheels" in December

Information not listed on articles in the index, starting on page 12, frequently is listed in the **WHERE-TO-FIND-IT LIST**, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, Popular Mechanics, 200 E. Ontario, Chicago 11, Ill.

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in this corner.....

THE EDITORS



For the USS *Forrestal* story which leads off this month's editorial section on page 81, we commissioned the New York artist, A. Leydenfrost — whose work is familiar to PM readers — to fly to Norfolk, Va., and visit the growing hull of the world's mightiest carrier. There he sketched the two-page drawing giving the first glimpse of the vast interior of the vessel. With him went Dick Dempewolff, our Eastern Editor, to gather facts on the spot for his article.

To the Editor:

When the owner of a new automobile in the early days, 1910-1912, required a license plate for his car he presented the bill of sale or proof of ownership to the city clerk or county recorder. The line number in the record book was his license number.



He had his choice of making a homemade plate of wood or metal, or having the local harness maker turn one out on patent leather with nickel or brass numerals. This was fastened to the car with screw hooks or eyes, most bodies being made of wood.

E. M. Hamm,
Snohomish, Wash.

To the Editor:

The article by Mat Hooper on streamlined cars (*PM*, Aug. 1954) was quite
(Continued to page 8)

(Continued from page 6)

interesting, especially with regard to the title "One Out of Three Smashes Up."

If these cars were directionally stable, there would be no trouble with cars going out of control, either from the wind or from road disturbances.

The placement of the greater load on the front axle is only one of the requirements for directional stability. The second is that the center of pressure of the air flow forces behind the C.G. [center of gravity].

If these conditions are fulfilled, it is then possible to maintain direction even under the influence of a side wind. In fact, if the center of pressure is located accurately enough, direction can be maintained without any steering correction. With the center of pressure located nearly correct, some small correction is necessary, but the driver then has time, 1 to 2 seconds in which to make the correction, instead of the present 1/10 to 2/10 second.

Theodore R. Gondert,
Lyndhurst, N. J.

☆☆☆

Doing your Christmas shopping early? For some fresh ideas that will please the whole family, turn to our six-page Christmas shopping section on pages 100-105.

To the Editor:

Popular Mechanics' feature story in the September issue regarding hi-fi brings to mind my experience in the sound field some years ago. Since *PM* readers represent a most intelligent and creative group, I believe my experience may serve as sort of an inspiration for persons with a creative thought to muster greater courage to carry out their convictions in spite of tradition or laws exactly contrary to accepted and recognized procedure.

PM's story brought out the fact that the largest sound companies have today achieved the near ultimate in sound reproduction contrary to the long-accepted principle of recording only in cell-like plush-padded studios.

Upon my first venture in the production of a recording many years ago, I struggled, argued and reasoned with almost every sound engineer in sight in an attempt to produce a "live" recording with genuine "presence." My contention had been that for years on end recording companies had been distorting true reproduction by doing "takes" only in studios with sound-absorbing walls. In other words they were making an all-out effort to disguise true fidelity and reproduction through the years due to

(Continued to page 18)

"Here's the new greaseless way to keep your hair neat all day,"

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- High School Subjects
- Mathematics

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- Electronics
- Practical Radio—TV Eng'ing
- Radio and TV Servicing
- Radio Operating
- Television—Technician

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- Air Brakes □ Car Inspector
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- Locomotive Engineer
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MISCELLANEOUS

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- Marine Engineering
- Ocean Navigation
- Shiplining
- Short Story Writing
- Telephony

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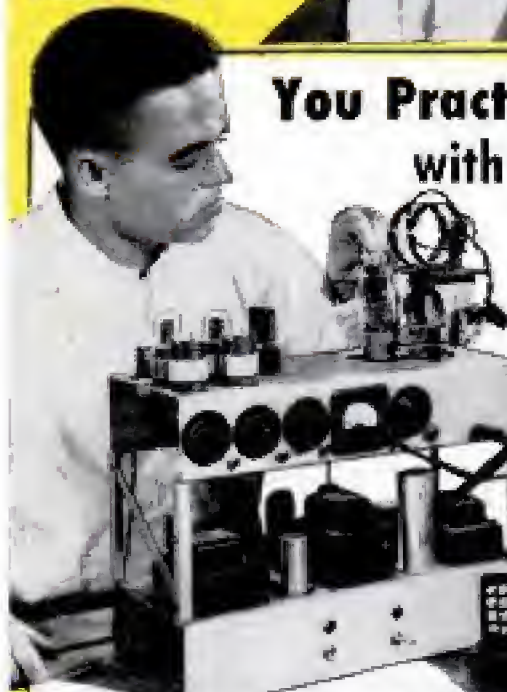
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As part of my Communications Course I send you parts to build low-power Broadcasting Transmitter at left, and other equipment. Use it to get practical experience. You put this station "on the air," perform procedures demanded of station operators. An FCC Commercial Operator's License can be your ticket to a bright future. My Course trains you to get your license. Mail Coupon now!

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Laborer
Finds
Success in
Radio-TV

"I was a laborer with no future. Now I have a position that pays well. My spare time servicing pays good money, too. Thanks to NRI."—Robert Ford, Johnston, Pa.



Switched
to TV
Servicing

"I recently switched from studio work and am now holding a position as TV service technician. Enjoy my work more and more."—Norman Ward, Ridgefield Park, N. J.



Paid for
Course, Car
in Spare
Time

"By the time I graduated I had paid for my course, a car and testing equipment. I can handle any job in Radio-TV."—E. J. Streitenberger, New Boston, Ohio



\$10 to \$15
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Airways Operator
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You get practical experience by working on circuits common to both Radio and Television. My graduates are filling jobs, making good money in both Radio and Television. Many NRI trained men start their own Radio and Television servicing business with capital earned in spare time. Let me show you how you can be your own boss; earn \$10 to \$15 a week extra even while still learning. Now is the time to get ready for success in Radio-Television. Coupon below brings you Actual Lesson and 64-page book.

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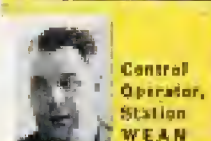
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Canadian Factory—London, Ont.

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Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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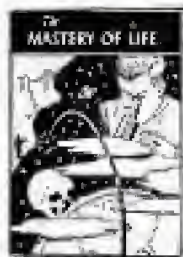


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(Continued from page 8)

a principle or "law" laid down during the early introduction of sound recordings to the American public. This law or custom remained unchallenged until in recent years, upon commercial acceptance and public demand it would likewise be contrary to go back to the long-heralded and untouchable procedure employed during the production of an old-fashioned muffled production.

The point or lesson I am bringing out is: If you have a conviction contrary to public or industrial acceptance, see it through and you may bring to light a "truth" long hidden due to lack of creative thought or fear of ridicule.

I recall the long, hard fight I had attempting to employ present-day recording techniques some years ago when they would "cork" me up during a wax session. In fear of ridicule and engineering disfavor I finally relented. I let them destroy creative thought to postpone the "live" recording technique for introduction in later years, rather than sticking to my guns. Don't let it happen to you!

Herbert Horn,
Chicago

To the Editor:

Referring to the King Midget you write about (PM, July 1954) I have one and it is a dream come true. It has never refused a hill nor even hesitated, and we have some hills in Kansas City. I can go where I want when I want. Carry an extra gallon can of gasoline and can circumnavigate the globe (which statement is only slightly exaggerated). Takes up so little space on the highway. No sir, I would not trade.

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Marie Higinbotham,
City Hall,
Kansas City, Mo.

Editor:

I would like to congratulate you on your article, "The Car That Comes in a Crate," in the July issue. I have one of these fine little King Midget cars, a 1951 model that has been run until the tires are perfectly smooth, which means something like 100,000 miles as near as we can determine.

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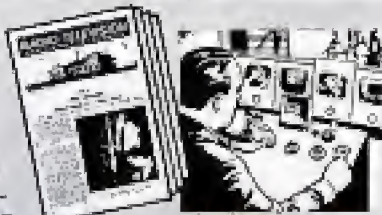
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700-16	6.12	760-15	5.72	750-15	10.42	900-20	17.62
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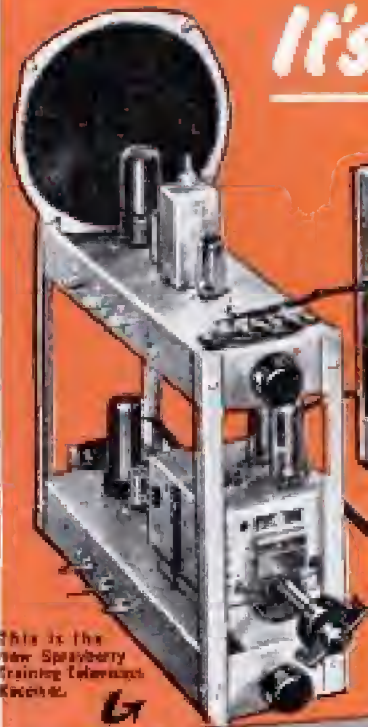
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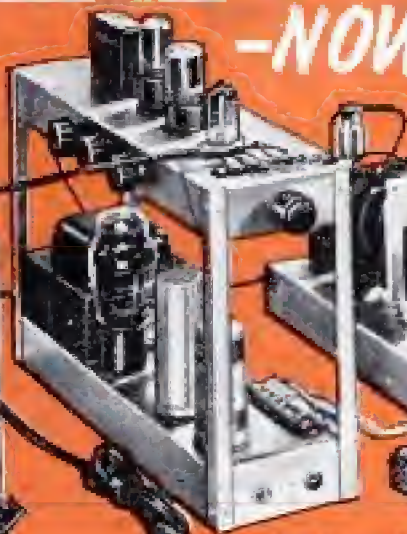
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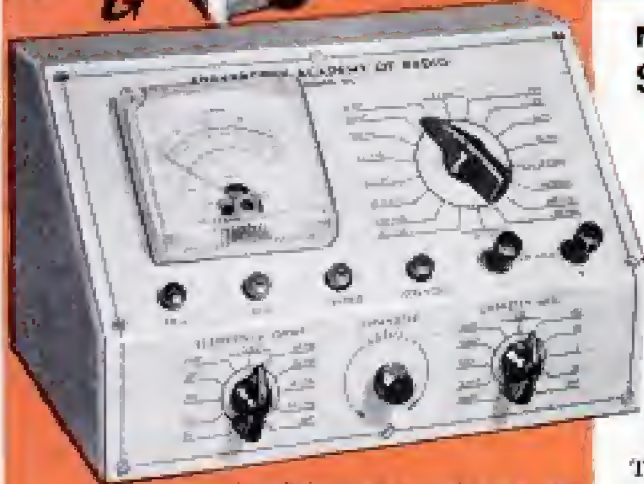
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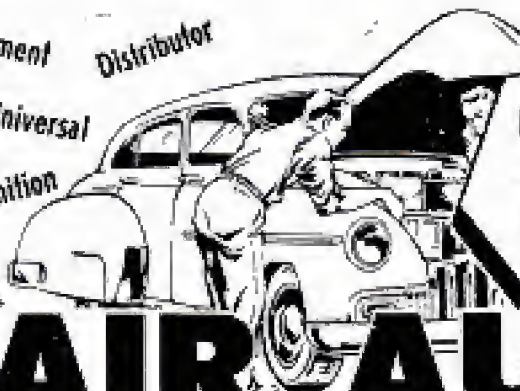
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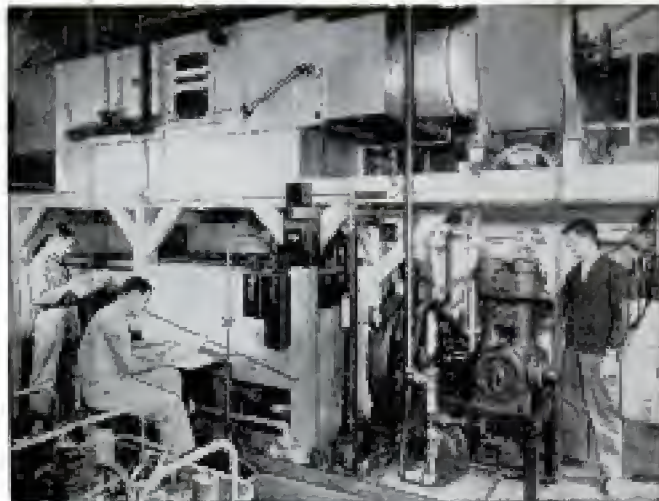
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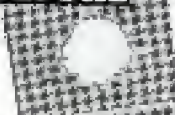
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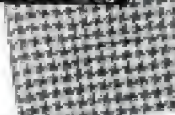
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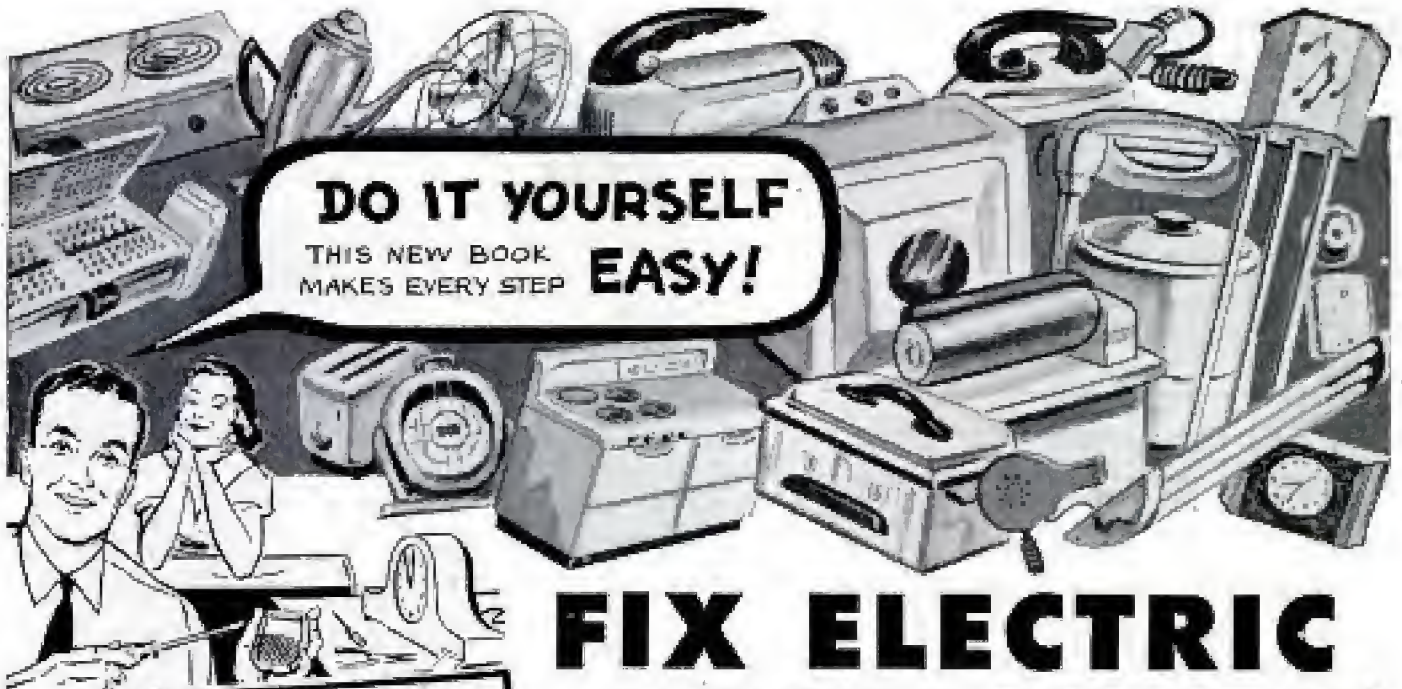
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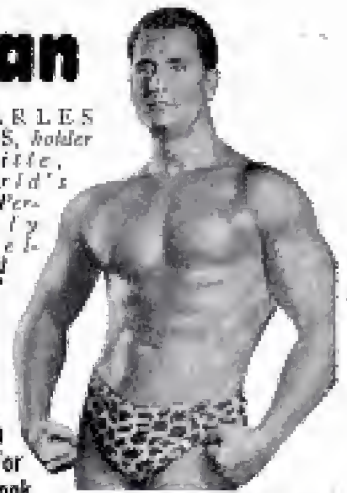
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1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill.; Editor, H. B. Windsor, Jr., 200 E. Ontario St., Chicago 11, Ill.; Managing Editor, R. M. Grant, 200 E. Ontario St., Chicago 11, Ill.; Business manager, W. H. Peiridge, 200 E. Ontario St., Chicago 11, Ill. 2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill.; H. B. Windsor, Jr., 200 E. Ontario St., Chicago 11, Ill.; H. B. Windsor, Jr., Trustee for H. B. Windsor III and Wm. T. Windsor, 200 E. Ontario St., Chicago 11, Ill. 3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. 4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs above the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner. 5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semi-weekly, and tri-weekly newspapers only.) Not daily publication. H. B. Windsor, Jr., Editor, publisher, sworn to and subscribed before me this 8th day of September, 1954. Vera L. Frechill, Notary Public, (My commission expires July 17, 1958.)

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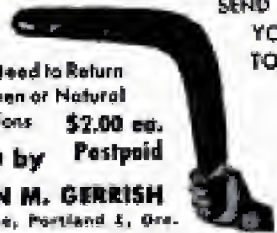
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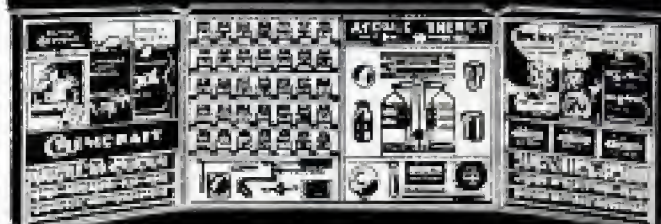
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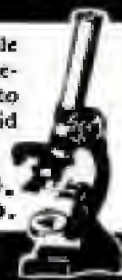
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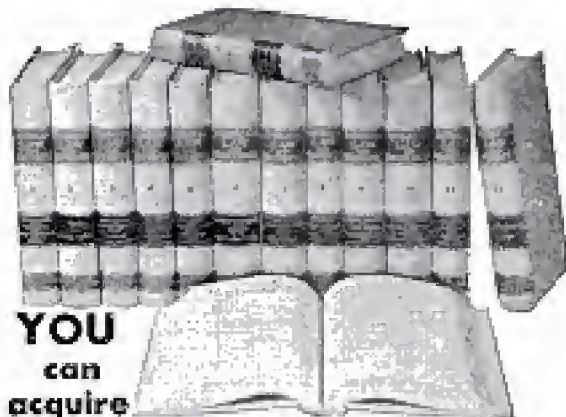
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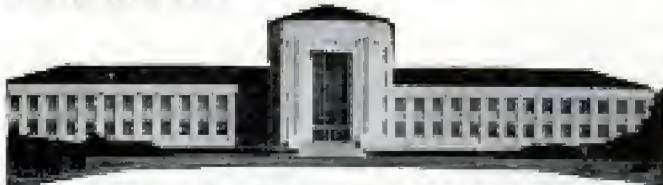
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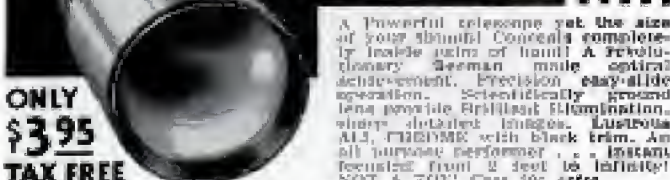
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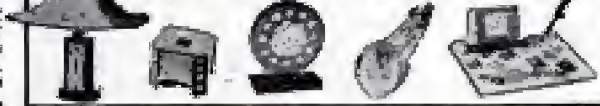
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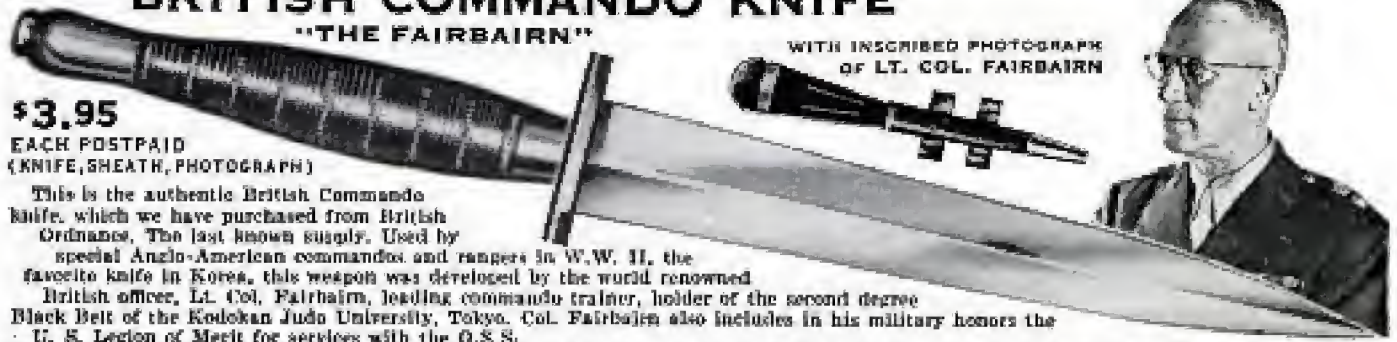
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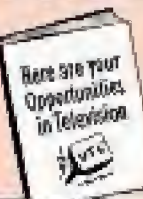


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FREE 208 Page 1055 television-radio-electronics catalog! World's largest stocks, lowest prices. Complete supplies for builders, experimenters, amateurs, servicemen. Latest builders' kits, TV, Hi-Fi, phones, records, P.A. Thousands of parts, tubes, test instruments, books, diagrams. Top quality money-saving values. Get your copy now! Allied Radio Corp., 100 N. Western Ave., Dept. 34-L-4, Chicago 90, Ill.

BUILD 15 Radios at home—Only \$19.95 complete. Learn radio construction, theory, trouble-shooting, code, F.C.C. regulations. Complete radio course includes all parts, components, instruction books, etc. Free radio tester and soldering iron. You keep everything. No experience required. Money-back guarantee. Order direct or send for descriptive literature. Valuable radio and TV guide upon request, free of charge, no obligation. Progressive Edu-Kits Inc., 497 Union Ave., Dept. PM23, Brooklyn 11, N. Y.

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WHOLESALE Parts Dyer Inc. Wholesale Electronics, 673 Elton Avenue, New York City 51.

TEST Equipment repair. Kit construction. Free information. Bigelow Electronics, Dept. PM, Beulah, Michigan.

REPAIR Your own TV. Instructions compiled exclusively for your set. Simple as replacing light bulb. Send set name, chassis, model number, \$2.95. LB Engineering, Box 4113-PM11, North Hollywood, Calif.

INSTRUCTIONS How to repair radios \$1.00. State's Radio Service, Corsicana, Texas.

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BUILD Crystal set, add tubes, speaker, Troubridge, 312 West 15th, Chicago 21.

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POPCORN And potato chip equipment. Ekins, Box 933-A, Springfield, Ohio.

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NATURAL Molding rubber, extra thick. Free sample. Flock, W. Wooley, 113-A Donald, Peoria, Ill.

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RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

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BE President of your own manufacturing or selling corporation! If you have a sound idea for a product or service and need money or manpower, perhaps we can help. Send self-addressed, stamped envelope and 25c for brief outline of our offer. P. M. Bronley, c/o Wilbourne & Beasley, Engineering Building, Chicago 6, Illinois.

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MAKE Big money at home! Invisible re-weaving pays up to \$10.00 profit in an hour. Make tears, holes disappear from fabrics. Constant demand from laundries, cleaners, homes, brings steady earnings. Details free. Fabricon, Dept. AE, 8343 S. Prairie, Chicago 18, Illinois.

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BOOKKEEPERS! Forget debits, credits, double entry! Govt. investigators want records, not systems. More firms use our simple, inexpensive method than any other. Popular demand. Unlimited earnings. Age no barrier. Live anywhere. Amazing details free. Penna. Business Service, Box 823, York 3, Penna.

EARN \$50.00 Daily making mats, shoes and mud guards from old tires. B and S Patents Inc., 1307 North Clark St., Chicago 10, Ill.

FREE Folio "Startling Unlimited Vacations Plan." No merchandise, equipment. Unknown! Works itself—home! Proven successful. Haytings, Carlsbad, Calif.

LEARN How to make money. Details free! Wredo, Atkinson, N. C.

FOREIGN Employment construction work. If interested in foreign projects with high pay write Foreign Service Bureau, Dept. P.M., Metuchen, New Jersey.

PRINTING And office supplies wholesale. 20,000 items. Literature free. Royal, Box 368-A, Cleveland 27, Ohio.

ATTENTION! Typewriter owners. Make handsome profits. Write today. Groves Company, 662, Hastings 6, Nebraska.

MONEY Troubles? Kick rising costs with little home business. Send 35 cents for new booklet containing dozens of plans and ideas. Atlantic Publications, Box 1103, Riverdale, Maryland.

GENERAL Contest Bulletin. Issued monthly. Sample, 26c. 1609 1/2 East 5th, Duluth, Minn.

NEW Baby items. Agents, salesmen, distributors. Natural for mail order. Write: Liebig Industries, Beaver Dam 5, Wis.

100% PROFIT! Mexican featherbird pictures. Hot sellers! Edmunds, 2009-P Weaver Ave., Baltimore 14, Md.

SELL Books, merchandise by mail. Tremendous profits. We furnish everything. Ship your orders. Write: Tradewinds, Box 8236, Chattanooga, Tenn.

GROW Mushrooms. Cellar, shed, and outdoors. Space, full time, year round. We pay \$3.50 lb. We paid Rabbit \$4,185.00 in few weeks. Free book. Washington Mushroom Ind., Dept. ITJ, 2054 Admiral Way, Seattle, Washington.

SPARETIME Profits taking subscriptions, all magazines. Wholesale catalog free. Cassel Agency, Westfield 2, New Jersey.

50,000 ARTICLES Wholesale. Source directory free. Nelka, Box 3462-DR, Chicago 34.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

WINNING Prize contests is fabulous, confidential, home opportunity! Send stamp! National Contest Bulletin, Box 2665-P, Miami 18, Florida.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

MAKE To \$4.50 hour doing common pen lettering. National Artists, 801 1/2-A North Marsalis, Dallas 3, Texas.

BUILD Sales by recruiting productive distributors selling direct or to retail outlets. Secure most concentrated circulation through classified columns of Salesman's Opportunity. Write for facts. Gilbert, Salesman's Opportunity, Room 1700, 24 East Jackson, Chicago 4.

SELL—Buy Titania gems. More brilliant than diamonds. \$9.75 carat wholesale. Free catalogue. Diamondite, 1404-M Mitchell, Oakland 1, California.

SCHOOL Seniors—Sell classmates America's most beautiful graduation name cards. Largest selection. Highest commission. Outlets all others. Free sample kit. Printcraft, Dept. M, 1309 Maple Street, Scranton 5, Penna.

FREE! "201 Profitable Small Businesses." Amazing shoestring plans! Work home! Start sparetime. Diamond Surveys, Keenore 23-PM, N. Y.

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. BU-CM, Pleasant Hill, Ohio.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 830-P, Linden, Buffalo, N. Y.

INCREASE Your income, turn your spare time into cash—Making quick-selling, highly profitable lamps and fiber glass shades. Every home a prospect for one or more. Hundreds already doing it, so can you. No experience needed. No special tools required. Gearon's big, new 72 page 1954 Illustrated Catalog No. 8 will show you how, quickly. One special 8-page section shows 6 beautiful lamps in kit form, ready for you to assemble. Another 12-page section shows you how to make stunning, ultra-modern fiber glass shades. Page after page filled with wide variety of other attractive shades, shade frames, figurines, and lamp bases. Also oil lamp converters, boring compound, and all kinds of cords, sockets, pipes, harris, finials, bases, and hundreds of other parts. Everything you need. And you can buy everything wholesale, sell at retail, make big profits, fast. Send only 25c right now for Gearon's big 1954 catalog and wholesale price list. Like hundreds of others, you'll be glad you did. Gearon Co., Dept. 503-B11, 27 S. Desplaines, Chicago 6, Ill.

COLLECTORS Paying up to \$200.00 for old phonograph records, complete listing thousands of records wanted, prices paid (25c coin). Lixmart Company, 3404 No. Figueroa, Los Angeles 63, Calif.

LEARN Technical Metaphysics and insure your future. Easy, inexpensive correspondence course. Simplest method known. Diploma. Write: Frontier College of Technical Metaphysics, 2532 McKenzie St., Vancouver, B.C., Canada.

BUY Wholesale! Nationally advertised merchandise, Catalog, 50c, Levesque, Box 4-B, Atlanta, New York.

AMERICAN Manufactured watches 30% to 80% discount. Includes postage, taxes, insurance. Free circulars. Richmond Enterprises, Box 1003, Augusta, Georgia.

CASH Selling unusual, discarded, old and rare items found around every house, \$1.00 to \$1,000 profit. Informative booklet only \$1.00. Everett Anderson, Box 3, Wheeler, Oregon.

\$10,800 PROFITS! Your own mailorder business? No risk! Success plan free! Treasury, 709 Webster, New Rochelle, PM-25, N. Y.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

FUTURE Security? Learn watch, clock repairing at home. Inquire. Modern Technical Supply, 35-PM West 42 St., New York 36.

MAKE Money at home as renewal headquarters for all magazines. Big Christmas sales profits now. Liberal commissions. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500C, Mount Morris, Ill.

MONEYMAKING Bargain opportunities, directory 25c. DeLacorte, 2357 Crotona Ave., New York 58.

JIGSAW, Bandaw owners, let your machine bring extra profits, 100. Free details. Nu-Art, Dept. D, Box 2335, Boston, Mass.

\$200 MONTHLY Possible raising earthworms! Backyard, garage, basement. Complete. Illustrated booklet explains raising, feeding, packing, marketing. 25c postpaid! Clark Worm Farm-J, Willow Springs, Mo.

50% PROFIT Selling golden letters kits. Trial 100 Imprints 25c. Rochester Novelty, Winton 15, Minnesota.

"MAIL Order Secrets" plus money-making proposition. 3 other offers! Sample! 25c brings packet. Jenkins, 633 South Bradock Avenue, Pittsburgh 21, Penna.

CASH For sparetime. New plan. Free details. Transamerican, Box 835-A, Atlanta 1, Georgia.

PROFIT! Prestige! Publish a magazine under your own name! Only \$3 per month! Same, details \$c! Filmer, 810 Marion, Pharr 22, Texas.

SPECIALTY Farmers can make \$5000 per year on five acres. Free circular. O'Fling, 2313 North 10th, St. Louis 6, Mo.

JUST An honest living. Tested radio-mail order method. Free details. Carter, 114 1/2 W. Washington, Gainesville, Ga.

YOU Can succeed too! This brief simple procedure has helped others to wealth, health, happiness. It can make your success quicker, easier. Complete procedure \$1.00. Money-back guarantee. Get yours now! Litho Publishing Company, 1627 Belmont Avenue, Seattle, Wash.

FREE! Do-it-yourself leathercraft catalog. Write Tandy Leather, Box 397 AM, Tulsa, Oklahoma.

SENSATIONAL—Money maker. No selling. Fix pens. Rush \$1 for kit of parts, instructions, etc. Pentix, Box 28, Reading, Penna.

BE Independent! Fantastic profits! Shoestring investment! Here's how! Write Chemistry, 839 Dufferin, London, Ontario, Canada for free formula worth \$3.00.

SILVER Mirrors. Formula and instructions, \$1.00. Helm Novelty, Box 296, Parker, Indiana.

OPERATE profitable postal box collection Agency. Information and sample form \$1.00. Collector, Lake City, Minnesota.

PROFITABLE Sparetime home business or hobby. Complete instructions \$1.00. Harco, Lawrenceport, Nova Scotia, Canada.

NEW 7"x11" Ultra-Blue signs, 7c, retail 30c. Sample free! Lowy, 822 Broadway, Dept. 816, New York 3.

WITHOUT Requiring any greater effort than the work you now do for just a mere living. "Beckoning Fortune" takes you along the same path actually trod by every successful man in his rise to wealth and power. It could be your life's turning-point. \$2.00 postpaid. Phillips Company, Box 6317, Towson 4, Maryland.

WHOLESALE! \$999 Nationally famous products. 80-80% discounts! Large catalog. Sensational business plans included. Consolidated Distributors, 21-13 Lafayette, Paterson 15, New Jersey.

BE A director of money-raising drives for churches, hospitals, institutions. Highly paid profession taught at low cost. Backed by thirty-four years experience. William Arbogast, 229 East Mason Avenue, Alexandria, Virginia.

EASY! Two way system home operated business. Profitable. Write, R. Costo, Kennon, West Virginia.

BUY Wholesale! Thousands nationally advertised items. Save—make money! Free details. Dures, Box 672-PM, Chicago 90.

FORMULAS. PLANS. ETC.

300 YEAR Calendar in your hand. Know day of week when date's known. Code \$1.00. Krystop, Felton, Calif.

LIFETIME Business! Manufacture extremely profitable products! Lists free! Thermolab, Feoria 4, Ill.

FREE Formula catalog. Anything analyzed \$5.00. Western Chemical, Salem, Oregon.

75 PROVEN Formulas. Easy way to extra cash. \$1.00. Jensen, Lewiston, California.

FORMULAS, 10,000 for \$5.00. Authentic, reliable, practical. Brockway, 1145 High, Topeka 1, Kansas.

MODERN Formulas. Literature free. Jack, Consulting Chemist, 5138 Gainer, Philadelphia 31.

FOR Proof of what you can do in specialty manufacturing get our literature. It's free! Miller, Chemist, 1617-P, Tampa, Florida.

ANY Formula \$3.00. Catalog—Mfg. Treatise 10c. J. Belfort, 192 N. Clark, Chicago 1.

FORMULAS; All kinds. Latest, best. Literature free. Kemikal, Park Ridge, Ill.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

PRODUCT Analysis, manufacturing formulas, processes developed. Moderate fees. Plastics, Box 1574, Boston 4, Mass.

PLASTICS

PLASTICS Home-craft course for men and women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for free booklet. Interstate Training Service, Dept. D-3-M, Portland 13, Oregon.

PLEXIGLAS. Lucite sq. ft. (12"x12") cost 1/16" \$1.14, 1/8" \$1.50, 3/16" \$1.95, 1/4" \$2.20. Add 10% for postage. Almac Plastics, 800 Broadway, New York 13, N. Y.

CASTING Plastic, crystal like, new formulation. 1 1/2 pounds liquid Numold and complete kit including colors and instructions. Start profitable hobby at home, make your own Christmas gifts. Only \$6.00 postpaid. Information on request. Virginia Research Laboratory, Dept. D-11, Marietta, Virginia.

MONEYMAKING Liquid casting plastic. Complete kit \$3.00. Handbook only 50c. Kemikal Corporation, 2735 N. 5, Milwaukee, Wisconsin.

PLEXIGLAS. Lucite. Square foot cost 1/16" \$1.10, 1/8" \$1.53, 3/16" \$1.88, 1/4" \$2.23, 3/8" \$3.23, 1/2" \$4.34. Colors add 10%. Send 10% for postage. Aristocrat Plastics, Inc., 55 Clarkson St., New York City.

PLEXIGLAS Sheets—Cut to size. Clear. All thicknesses. Standard outdoor translucent colors. McClarin Plastics, P.O. Box 1688, Hanover, Penna.

HIGH Profits—Jewelry, gifts, novelties. Free catalog. Pilot Plastics, 87-C Fulton, New York 38.

LAMINATORS Increase sales or if you are entering this field we can help you. Details free. National Association Plastic Laminators, 707 Market St., Knoxville, Tenn.

TUBE For water level. See Hydrolevel ad in "Make It Yourself" classification.

PLASTIC. Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

CHEMISTRY

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept. M-50, Biological Supply Co., 1178 Mt. Hope Ave., Rochester 20, N. Y.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scopes, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124 West 33rd Street, New York, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 25c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS, Supplies. Catalog 25c. Laboratory Sales, Box 161-A, Brighton, Mass.

GEIGER Counters, \$29.95 up. Free catalog. Atomic Laboratories, Box 343, Berkeley, California.

BUY IT WHOLESALE

DO Your Christmas shopping, year around buying from your easy chair at big savings. Jewelry, silverware, watches, appliances, toys, power tools. Hundreds of other items. Send 25c for big name brands catalog. Refundable on first purchase. Karlen House, 210 Fifth Avenue, New York 10, New York.

EARLY Christmas shoppers? Wholesale catalog, bonus plan. Complete line nationally advertised merchandise. Petite Company, 1354-PM West 11 Street, Brooklyn 4, New York.

NATIONALLY Advertised merchandise. Rush 50 cents for illustrated catalog showing retail prices to Edward Clemens, 318 W. Bridge St., Morrisville, Penna.

BUY Wholesale direct! Save up to 66% on nationally advertised appliances, home-wares, watches, cameras, sporting goods, toys, giftwares. Free catalog. Wholesalers Mart, Box 8125ER, Houston, Texas.

WHOLESALE Pricelist—Refrigerators, washers, televisions, power tools, typewriters, 25c. Belmont, 861 Dumont Ave., Brooklyn 7, N. Y.

WELL Known brands stainless steel cook ware, appliance, jewelry, radio. We sell 1/2 price. Sale catalog 25 cents. Elbert Pratt, Box 303, Titusville, Penna.

SAVE 50-75% On your Xmas shopping. Free gift with every catalog. Nueblings-M, Sicklerville, New Jersey.

WATCHES! Watches! Tremendous discounts. Particulars free. Econ-O-Mart, Box 535A, Morristown, New Jersey.

AGENTS, Salesmen, buy standard brand merchandise at rockbottom wholesale prices: \$49.50 watches at \$22.95, \$49.50 dinner sets at \$15.00, \$1.00 ladies first quality nylon hose at \$6.50 per dozen. Ladies cleavage \$8-\$10 fall and winter dresses at \$1.30. Other sensational values in clothing, silverware, jewelry and appliances. Minimum order \$10.00. Send \$1.00 for catalog with confidential price list. Refundable first order. Merchandise Dept. P-10, P.O. Box 66, Bronx 39, New York.

WHOLESALE! 8000 Nationally famous products. 20-60% discounts! Large catalog. Sensational business plans included. Consolidated Distributors, 21-14 Lafayette, Paterson 15, New Jersey.

APPLIANCES, Watches, thousands more, catalog 50c (refundable). Buda, Box 124PM1, Oneida, N. Y.

AGENTS WANTED

"FOG-Stop" windshield cloth. Instantly removes heavy mist, frost, sleet, snow. Stops windshield fogging. Samples sent on trial. Kristee 61, Akron, Ohio.

FREE New 1954-55 wholesale catalog free. Appliances, household items, toys, gifts, jewelry, refrigerators, radios, air conditioners, washing machines, freezers. Hundreds of items on which you can make a handsome profit. Space on cover for your own name and address. Write today for big wholesale illustrated catalog free. Helen, Inc., 125 Fifth Ave., Dept. M, New York, N. Y.

EARN \$100 Cash and more by Christmas plus valuable contest prizes! Just take friends' and neighbors' subscription orders for all magazines. Write today for free supplies to J. Foster, Coronet Agency, Dept. M, 488 Madison Ave., New York 22, N. Y.

ADVERTISED Watches, diamonds, pens, wholesale. International. GIK Roberts, Portland 4, Maine.

APPLIANCES, Cameras, watches! Large wholesale catalogue! Cam Company, 6806PM-20th Ave., Brooklyn 4, N. Y.

SELL \$3 Fire extinguisher. Every car owner and household a prospect. A real money maker. Fire Killer Co., 2481 Westport St., Baltimore 30, Md.

EASY Handwork makes fast-selling useful articles. Sample free. Sunnada Company, Brockton 61, Massachusetts.

MUSIC Greeting cards, Christmas specialties. Derby Publications, Parsonage, Cummington, Mass.

IMMEDIATE Success! Sensational profits! Used suits \$1.75, pants 35c, dresses 20c, shoes 20c. Operate from store, home, car. Free catalog. Superior, 2250-A Jefferson, Chicago 7.

EASY Extra income—Sell sensational new silicone scorch resistant ironing board cover. Good Housekeeping approved. Terrific \$1.98 seller! Send for free complete selling kit. Sample cover \$1.10. Menell Products, Dept. P—P.O. Box 431, Midtown Station, New York 18, N. Y.

HAVE A complete store in your pocket. Buy wholesale and make big profits. Send for free general merchandise catalog now. Jay Norris, Dept. P, 445 Broome St., New York City.

PRINTING. Advertising salesmen—Excellent moneymaking sideline selling decorative name plates, small quantities. Automobile initials, sign letters. Free samples. Ralco, XL, Boston 19, Mass.

CALIFORNIA Sweet smelling beads. Sensational sellers. Free particulars. Mission, 2328PM West Pleo, Los Angeles 8, Calif.

GOLD Or silver letters, numbers, windows, doors, trucks. 1" to 6", 300% profits. Free samples. Atlas-T, 544 West 90th, Chicago 20.

\$1.00 PROFIT Selling \$2.95 photo enlargement deal. Allen Studio, Riegler Bldg., Little Rock, Ark.

MAKE Extra money. Sell front door name plates to friends, neighbors. Retail \$1.95; you make \$1.00! Free selling kit. Modern Engraving Co., P.O. Box 104, Boston 14, Mass.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-D North Clark, Chicago.

IT'S So terrific you'll actually sell thousands! Brand new \$2.95 pocket check protector. Sales pouring in. A tremendous deal for you. Get your town today. Federal Products, Evanston 15, Illinois.

BARGAINS, Job lots, close-outs! Save up to 50% on clothing, hosiery, notions, drugs, cosmetics, gifts, jewelry, television, etc. 2000 items. 25c brings wholesale bargain catalog with special get acquainted offer which includes free \$1.00 merchandise certificate. Reliable Jobbers, 311-B North Desplaines, Chicago.

YOUR Own business—Used suits \$1.50, overcoats 85c, mackinaws 35c, shoes 125c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Marc, 1213AA South Jefferson, Chicago 7.

\$200 WEEKLY. New invention. Amazing 4-second Presto emergency tire chains, fit all modern auto wheels. National advertising building big demand. 3 sales daily to oil stations, dealers, etc. make \$200 or more weekly. Territory going fast. Write Presto Chain Co., Dept. P-30, Des Moines 2, Iowa.

SCHOOL Seniors—Be popular with classmates. Have spending money galore. Details free. Craftcards, Box 385-L, Pittsburgh 18, Pennsylvania.

NATION'S Leading wholesaler offers opportunity to own your own profitable easily operated mail order business. No investment, inventory, experience necessary. We show you how! Sell nationally advertised appliances, home-wares, watches, cameras, giftware, sporting goods, toys! Some 80% less than retail! Catalog, sales plan, and instructions free. United Distributors, 210 Post St., San Francisco.

\$300.00 PER Month selling 4 wheel riding garden tractors, full or part time, exclusive franchise. Anyone owning 1 to 10 acres prospect. \$400 capital required. Tiger Tractor Corp., Box "M," Keyser, West Virginia.

OWN Your own profitable wholesale merchandising business. No investment! Sell nationally advertised appliances, home-wares, jewelry, sporting goods everybody buys. Your own name catalog in color! We drop ship. Free brochure. General Wholesalers, Box 1195EP, Chicago; Box 3058EP, San Francisco.

AGENTS-Salesmen! Sell beautiful hand-colored plastic enlargements and sensational new personalized photo compacts, rings, bracelets, lockets, etc. Experience unnecessary. 40% advance commissions. We deliver, collect. Wonderful sideline—better full time. Free sample outfit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

NEW Magic garbage can holder beautifies can, prevents rusting, animals from upsetting. Low priced, sensational seller. Free photos. Kessler Corporation, 11A.O. Fremont, Ohio.

SPARE Time money plus new car as encouragement bonus. No house-to-house canvassing required. Amazing 80 gauge nylon. 3 pairs guaranteed 3 months or replaced free. Write Wilkitt, 17411 Wash., Greenfield, Ohio.

BUY Wholesale—25,000 items. Catalog 25c. Matthews, 1472-E2 Broadway, New York City 36.

FEATHERBIRD Pictures from Mexico! 100% fast, easy profits. Prompt service. Free details. Jacaman (PM-11), Box 1342, Laredo, Texas.

FREE! Private labels! Exclusive sales! Own a business! Sell radio PI, stores, mailorder. We supply product, plan, literature; you furnish executive management and employ salesmen. Vitamins, 2906PMA Beverly, Los Angeles 57.

BUY Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, 629-P Linden, Buffalo, N. Y.

\$15.20 AN Hour is what W. F. Wydallis reports he earns with amazing Presto Fire Extinguisher. Sells itself. No experience needed. Free sales kit. Merrill Industries, Dept. L17, 114 East 32nd St., New York 16.

NEED Extra cash? Get it selling Blair's unusual line of household and food products. Every housewife a prospect. Products sent on free trial. Write Blair, Dept. J1MX-1, Lynchburg, Va.

INCREASE Your income—Personal installed buckles, belts, cap badges. Free information. Hook-Fast, Box 480 (PM), Roanoke, Va.

PROFITS Unlimited in your own wholesale buying service. Save yourself 65% on 10,000 nationally advertised appliances, homewares, jewelry, sporting goods. Big profits selling others at discount! Free details. National Buyers Service, Box 4282C, Oakland, California.

SHINE Cars without "polish." New invention. Lightning seller. Cars gleam like mirror. Samples sent on trial. Kristee 63, Akron, Ohio.

REVOLUTIONIZES Rubber stamp business. 100% profit. Send 10c for sales plan. Fisher's, Dept. EM11, 4756 So. Central Ave., Los Angeles 11, Calif.

NEW Push button salt-pepper dispenser. Sprays it out! Can't clog. Can't spill. King, 55-P Cleander, West Springfield, Mass.

HIGH Profits in amazing unbreakable plastic housewares, tablecloths, drapes, utility covers. Largest selection, lowest prices! Free catalog. PM511. Acclaim, Box 4, New York 48, N. Y.

ENJOY 3 Color television filter screen now. Send \$2.00 for your screen size. S. George, 5004 Stanton Avenue, Philadelphia 44, Pennsylvania.

BUY Wholesale thousands items. List free. A Sales, 18-PM City Terrace, Newburgh, N. Y.

NATION'S Leading wholesaler offers opportunity to own your own profitable easily operated mail order business! No investment, inventory, experience, necessary. We show you how! Sell nationally advertised appliances, homewares, watches, cameras, giftware, sporting goods, total Some 80% less than retail. Catalog, sales plan and instructions; from United Distributors, 210 Post Street, San Francisco.

FREE Hosiery! Sensational new way to earn to 33 hour spare time! Introduce amazing hosiery by giving away free pairs to every man and woman, regardless whether or not final purchase is made! Nationally known luxurious nylon stockings guaranteed against runs. New miracle one size two-way stretch nylon socks, fit any size. Never sags or droops. Guaranteed one full year! Buy nothing. Deliver nothing. Advance cash plus huge cash bonus to 40%. Additional hose and gifts extra bonus. Postcard brings you samples of stockings and socks with money-making outfits absolutely free. No obligation. Kendex, Babylon 83, N. Y.

SELL Fishing plugs, made by Wisconsin guide. S. R. Blackstone, 403 Powers Ave., Madison 4, Wis.

BE Our exclusive agent in your community. Every car owner needs our new slip-on safety-belt, especially for his children's protection. Quick seller, 100% profit, no competition. Write for Folder P: Japan, 55 W. 42, New York City.

MAKE Money introducing world's cutest children's dresses. Big selection, adorable styles. Low prices. Complete display free. Rush name. Harford, Dept. M-5341, Cincinnati 25, Ohio.

BEAUTIFUL Feather pictures, 200% profit! Free sample. Aparrado 9086, Mexico 1, D.F.

CHAIN Saws. Wheel mounted. Timber-bush cutting, Money makers. Wholesale deal. Farmco-51, Excelsior Springs, Mo.

GOLD Letters, 10c. Signs painted. Frank Watkins Signs, 1241 Overton Park, Memphis, Tenn.

\$9.90 PROFIT Per dozen. Sell magnetic pencils to waitresses. Nicholson Corporation, 3402 Cahuenga, Hollywood 28, Calif.

MAGIC Thread, mend! Without sewing. Terrific seller and repeater, big profits. 30 second convincing demonstration. This amazing invisible liquid repairs, patches any fabrics in seconds. Won't wash off. Send 85c (refundable) for sample or write for more details. Utility Products Co., Niverville, New York.

BIG Profits selling ties (\$2.00 value) \$6.50 dozen. Free catalog. Empire Cravats, 611C Broadway, New York 19.

100% PROFIT, 100% Repeats. Automotive essential. Send \$2.00 for goods, naming territory wanted. Nassau Laboratories, Hackensack, N. J.

I Average \$125 weekly selling books by mail! So can you! Start anytime! Work home! Cooper, 245 Taunton, Buffalo, N. Y.

TWO New ball point pens, plain and retractable (showing imprinting) with refill problem eliminated. Sample dozen \$2.00 carded, two samples 50c. Nucleus Trading, 2440 Amsterdam Ave., New York City 23.

WHOLESALE! 8000 Nationally famous products. 30-80% discounts! Large catalog. Sensational business plans included. Consolidated Distributors, 21-10 Lafayette, Paterson 13, New Jersey.

\$1.00 WILL Bring you pair of the most wonderful wearing hose, plus our catalog which can help you make up to \$3000 sparetime. Wolfmark, 981 Roosevelt, Chicago.

EXTRA Money. Jewelry, each piece an original. Hand made. Sample \$1.50. Pass Laboratory, 13 Dogwood Road, West Orange, N. J.

JUST Take orders. We deliver. Gadgets. Send 25c. Miss Ann, Jackson Heights 14, New York.

SELL Imported slide rules to students. Hoffman, 682P, Passaic, New Jersey.

80% PROFIT On cosmetics—Famous nationally advertised Hollywood Cosmetics pay 80%! Make \$29 day up! Hire others. For free samples, details, write Studio Girl, Glendale, Calif., Dept. PM-114.

SALESMEN—DISTRIBUTORS

SELL "Dandy"—Fast moving automotive accessory. Dandy, Box 5, Columbus, Ind.

AMAZING New hand cream. Does wonders. Entirely different. Whirlwind seller. Fast repeater. Free money-making offer. Sergeant Co., Highland Mills, N. Y.

30,000.000 WOMEN Want amazing new automatic refrigerator defroster. You sell 8 out of 10 on sure-fire free trial. \$250.00 weekly profit net commission. Rush postcard for guaranteed plan. D-Frost-O-Matic, Dept. T-102, 173 W. Madison St., Chicago 2, Ill.

DISTRIBUTORS. Large profits. Terrific repeat orders. Unique Italian brooms. Write Peacock, 400 Montgomery Street, San Francisco, California.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

\$5.75 PROFIT On every sale of Lightning portable adding machines, retail \$14.95. Wide market. Full details, actual size color photo free. Lightning Adding Machine Sales Company, Dept. A-147, 234 West 37th Place, Los Angeles 7, Calif.

ANYONE Can sell famous Hoover uniforms for beauty shops, waitresses, nurses, doctors, others. All popular miracle fabrics—Nylon, dacron, orlon. Exclusive styles, top quality. Big cash income now, real future. Equipment free. Hoover, Dept. H-100, New York 11, N. Y.

SALESMEN, \$50.00 In a day definitely assured, selling brand new item going to every type of food and beverage store, factories, laboratories, hospitals, etc. Samples furnished. Quality Durawear, 83 West Jackson Blvd., Dept. PM-11, Chicago 4, Ill.

CALENDARS. Advertising novelties, matches. All styles, including religious, varnished, 12 sheet, girls. Hundreds of advertising novelties, books matches, etc. Fleming Calendar Co., Sales Division, 6539 Cottage Grove, Chicago 37, Ill.

GET New shirt outfit free; make \$90.00 weekly on 5 average orders a day. Famous quality made-to-measure dress and sport shirts at \$3.95 up sell fast to all men. No experience needed. Full or part time. Write: Packard Shirt Co., Dept. 741, Terre Haute, Ind.

MONEY Making opportunity! Take big profit orders for world famous patented varieties fruit trees. Also flowering shrubs, roses, vines. Big sales outfit free. Stark Bros, Desk 30155, Louisiana, Mo.

AD Matches! Sell amazing designs—10, 20, 30, 40 and 240-light book matches. Biggest spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. PM-59, Chicago 32, Illinois.

BIG Money-making opportunity. Exclusive line work uniforms. Jackets, pants, shirts, coveralls. Advertising embroidered. Every business prospect. Outfit free. Master Div., 261 Water, Ligandier, Ind.

PLASTIC Signs. New self-adhering interchangeable. Big sales, all type stores. 1208—20th Ave., San Francisco 22.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-1154, 7330 Greenwood, Chicago.

BUY Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, 630-D Linden, Buffalo, N. Y.

BAR Items and bar gags at wholesale. Resell at 40% profit. Distributors wanted. Collins Products, Box 463, North Hollywood, Calif.

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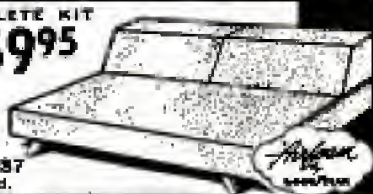
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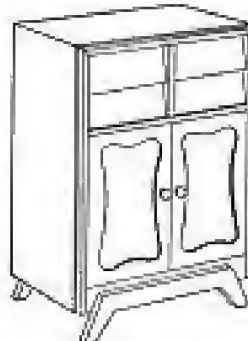
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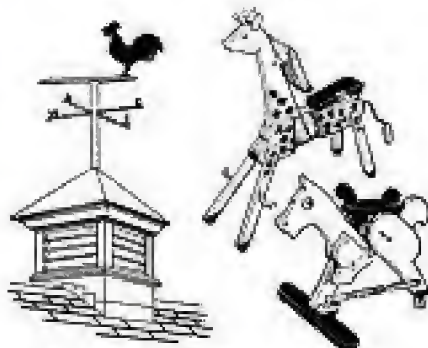
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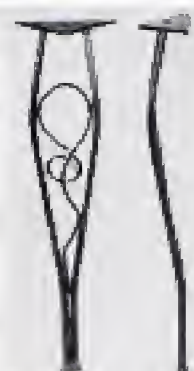
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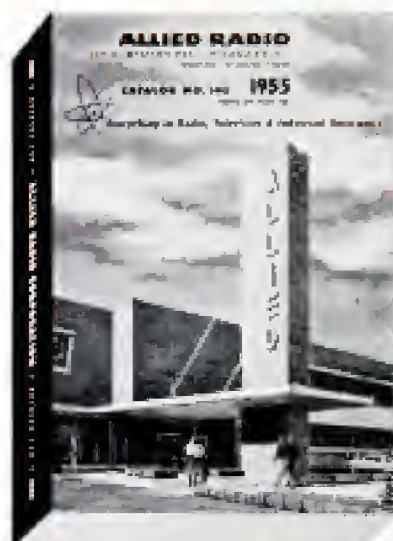


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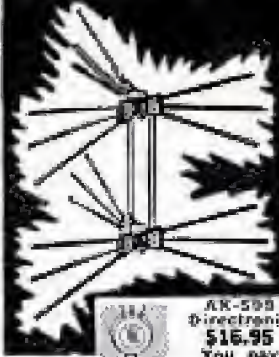
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WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 102 NO. 5

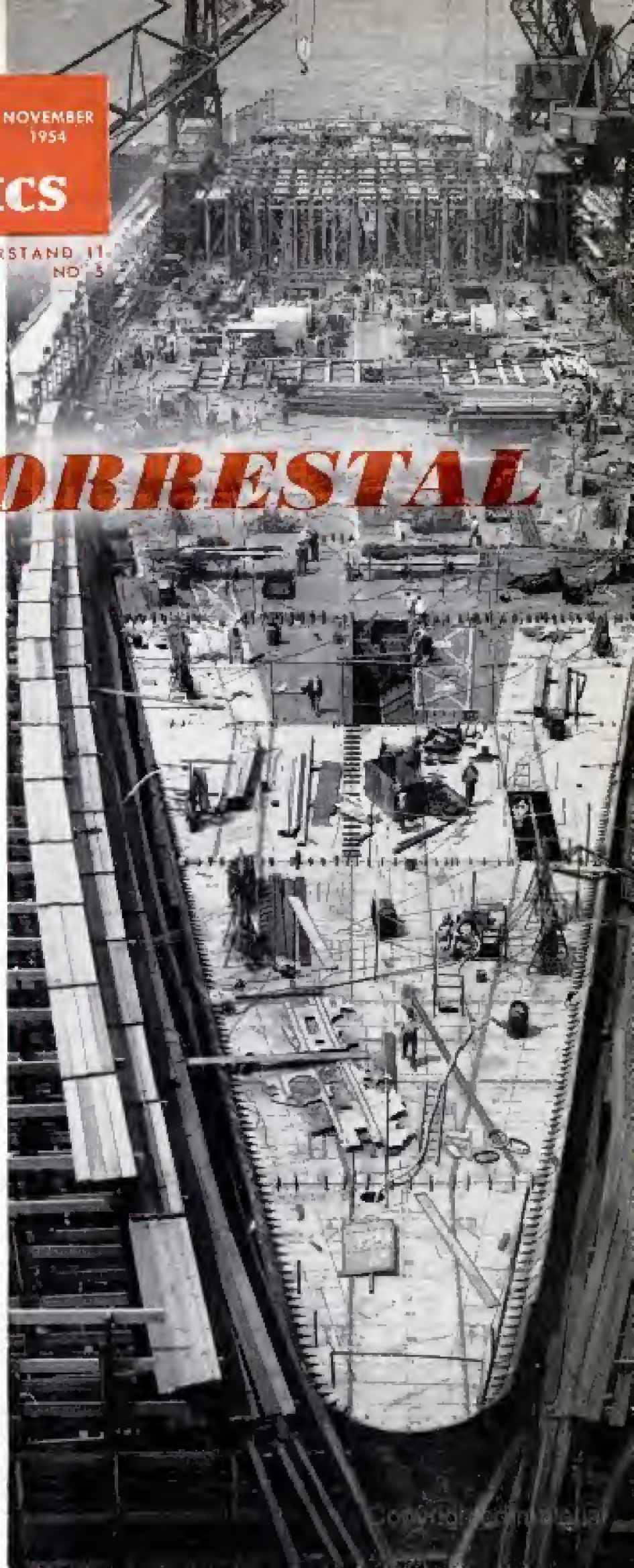
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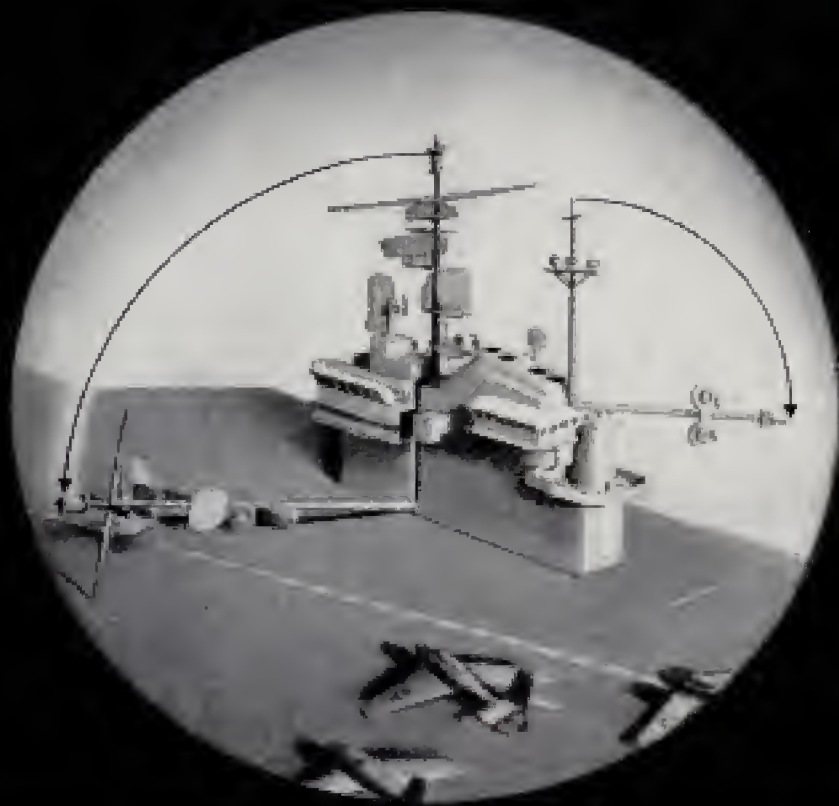
USS FORRESTAL

By
Richard F. Dempewolf

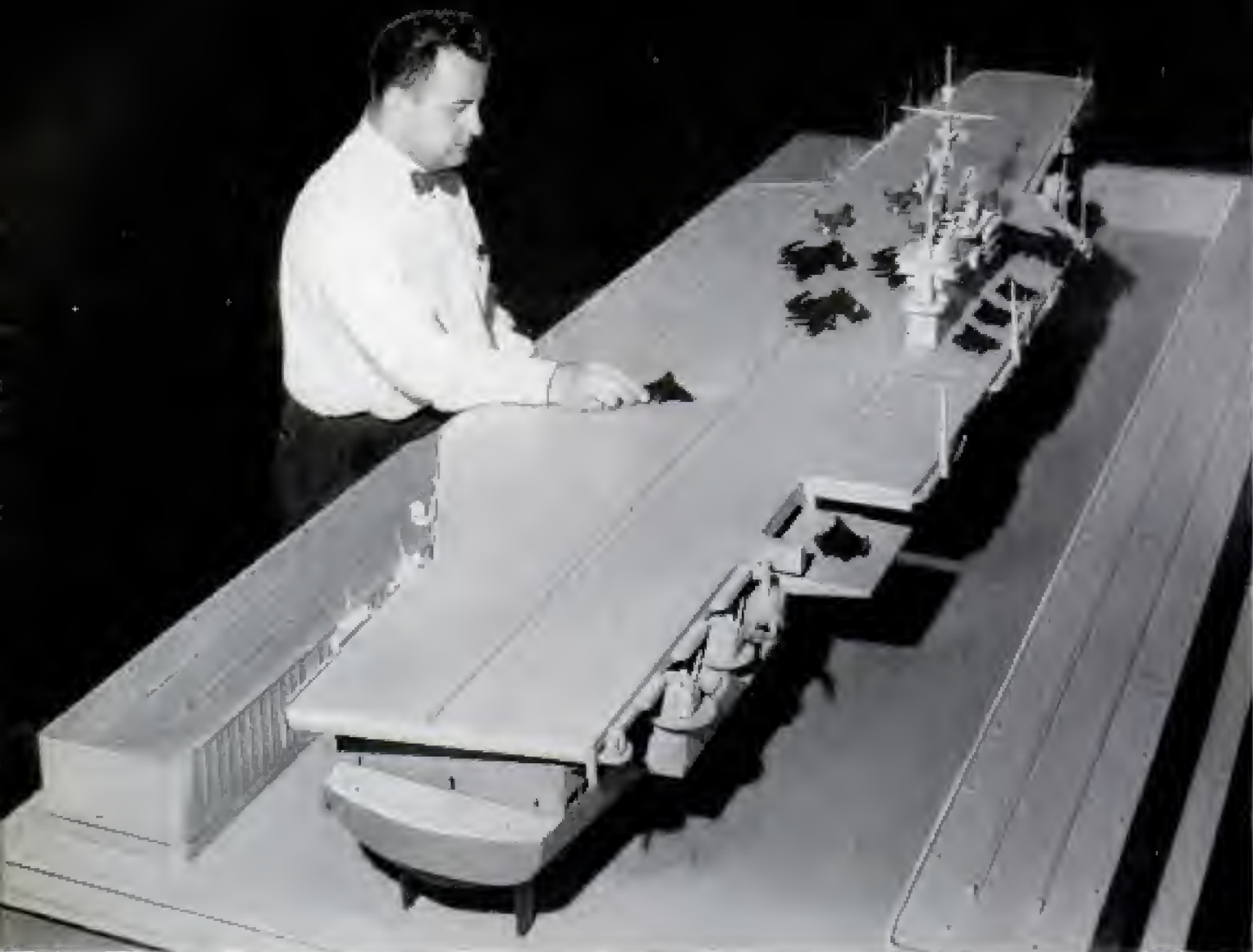
BESIDE a yawning concrete abyss three city blocks long, six stories deep and twice as wide, giant cranes rear against Virginia's coastal skies like monsters from the Age of Reptiles. Towering booms reach down like dinosaur necks. Powerful jaws grab and lift the last few 75-ton, house-size assemblies that remain to be placed on the most fantastic honeycomb of seagoing steel ever put in one pile by mankind.

Right now, that mammoth pile at the Newport News Shipbuilding and Drydock Company is a bedlam of sound and confusion. A walk through its endless maze of dimly lit caverns compares with a stroll through the Maginot Line under bombardment. A deafening clatter of riveters and chippers batters your eardrums, over the nerve-shattering background of a thousand electric grinding wheels bur-nishing steel plates. On every side, the smoky haze, laden with smells of strange gas and hot metal, is pierced by the sudden, blinding glare of blue light from hissing torches that shoot cascades of molten steel high in the air just like





MASTS TIP LIKE DERRICK BOOMS TO PERMIT SHIP TO CLEAR THE BROOKLYN BRIDGE



Stern view of *Forrestal* model shows canted rear lip of flight deck. Pilots land planes in slanting line

fireworks. Over all, as you stumble through forests of massive shoring timbers, is the rolling thunder of multiton steel plates dropping into position up above, and the rumble of the traveling giant cranes.

But before next month is out, the bedlam will subside to a hush. Some lady of note will smash a bottle of perfectly good champagne on a bow plate, and the 60,000-ton mammoth will become the USS *Forrestal*, CVA 59 (CVA stands for Carrier Vessel—Attack). She'll be floated into the James River to join the Navy as first in a new class of atom-age carriers—the biggest, most unique and expensive (\$218,000,000) in the world.

The immense size of the *Forrestal* is a strain on the wildest imagination. From end to end, her three-acre flight deck lacks only 284 feet of being a quarter of a mile long. Stand her on end and she'd line up with the tower base atop the Empire State Building. A walk across the flight deck at its widest point equals one city block—252 feet, or as wide as an old four-stacker destroyer is long. That's wide enough so you could sit both the SS *United States* and the SS *America* side by side atop the *Forrestal*,

and no part of either would overhang the flight-deck boundaries.

In his office at the yard, Capt. A. L. Dunning, USN, supervisor of shipbuilding for the Navy, can stagger you with superlatives. "Her four props—two four-bladed and two five-bladed—are 22 feet across," he points out. "They'd top the roof-tree of a two-story home. The biggest of her three vast rudders weighs about 45 tons and equals the floor area of a two-bedroom house. Her seven air conditioners, each 500 tons capacity, produce 600 tons more than the entire air-conditioning system of Radio City Music Hall. "They could cool both National Conventions with several degrees left over."

Because of her size, the *Forrestal* will never squeeze through the Panama Canal; she'll detour around Cape Horn. Since the 187 feet from water line to the tip of her 19-story radar and radio masts is just 60 feet too many to clear Brooklyn Bridge (under which she must pass to get to Brooklyn Navy Yard), engineers employed a neat trick. The towering masts are collapsible. They are raised or lowered by cablelike derrick booms.

Stand on the towering island overlooking the expanse of flight deck and, as the officials in charge of the project reel off graphic descriptions, the welders and riveters fade away. The deck comes alive with big delta and swept-wing sonic jets. You see this massive ship as she will appear in operation—utilizing tricks and devices that make her the most fantastic fortress yet conceived by engineers for an era of push-button war.

Older carriers with wood or jointed-steel decks were fine for propeller-driven fighter planes with low landing speeds and short take-off runs. But the *Forrestal's* six-squadron complement, totaling 80 to 100 planes, presents hair-raising problems. Her fire-shooting F3H Demon fighters and F4D Skyray interceptors blur in at speeds over 100 miles per hour. So do the Banshees and twin-finned Cutlasses that may streak across her deck. Her A3D jet attack planes can carry an A-bomb load nearly the weight of a fully equipped World War II carrier plane according to reports of aviation specialists. No ordinary wires, barriers or deck plates can contain these firebirds. "That," Navy officials explain, "is one reason the *Forrestal's* deck is one solid sheet of welded steel. Jet afterburners can actually kick chunks from a concrete runway."

At first, the towering five-story island from which skipper and flight officer control operations above the flight deck was to have been retractable. During operations, just push a button and it would lower into the ship's bowels like an elevator, to give speeding jets a clear landing field with no obstructions. A tricky TV system would have given the skipper, below, a picture of activity on the flight deck, plus a full view of the other side of the ship.

Stacks had to fold sideways, and the nightmare of communications lines made the job too complicated. So the British idea of a canted, or angled deck was adopted.

To get the full impact of how the unique deck and other innovations on the *Forrestal* work, try to imagine her majestic bow plunging through white spume on an actual mission, operations aboard in full swing.

The three-acre deck is aswarm with activity. The roar of jets warming up is enough to lift the scalp off your head. It actually causes bodily discomfort. The men you see scooting around on

buglike tractors spotting sleek jets on the deck, wear earplugs and muffs to keep from becoming shuddering wrecks. They're spelled off frequently because of the damaging noise level. Flight officers on the island bridge conduct operations by remote communication, for they are completely encased in a cabin with protective glass and soundproofing.

Incoming Skyray interceptors barrel in from a mission, streaking down the deck in succession, to be pulled up short as tail hooks snag arresting wires. On the *Forrestal*, they will not wham into barriers, flip over and wind up smoking or flaming wrecks amid planes parked on the bow if hooks miss the last wire. That used to happen occasionally. Nor are they likely to veer into the island if they get a "wave off" for poor approach—as sometimes happened on older carriers. And the reason for this? Canted deck.

Instead of landing straight in, *Forrestal* planes will land at a 10.5 degree angle from the starboard quarter of the ship's odd transom stern. That stern, incidentally, looks just like the rear end of a mammoth rowboat. Roaring in across the slanted lip of the flight deck, the jet pilot rockets toward the ship's bow—but 'way off to the left. He'll pass the island with more than 100 feet of clearance. A "wave off" will send him gunning straight ahead over blue water, far off the *Forrestal's* port bow, clear of the ship and parked planes.

To angle the "alley" required space—and is one reason the *Forrestal* is the widest

(Continued to page 262)

Side view of model shows 60-foot overhang of the flight deck. Planes land on the port side of angled deck and island side is for parking



Detroit Listening Post



By Leo Donovan

YOU'VE SEEN the first three—what do you think so far? The three cars introduced in this issue (page 88 and following) set the mood of the season. That mood is power!

High as they are, power ratings are only a base. You don't have to stop there. Companies (like Chevrolet) will offer special speed kits of four-barrel carburetors, dual exhausts and maybe superchargers to bring horsepower of the "small" cars far above what big cars boasted about a few years ago. In 1950, the highest advertised horsepower was 160 in the Cadillac and Packard. Today you buy a stock Chevrolet with 162 horsepower or, with optional extras, 180 horsepower!

By Thanksgiving Day, all but a few of the 1955 models will be in showrooms. Hudson dealers will be selling Nash Ramblers and Metropolitan under Hudson emblems before December 1. Engineering delays will probably keep the 1955 Hudson Hornet and Wasp from coming out until after the Nash Statesman and Ambassador in February. No official indications yet as to what will happen to the Jet.

Corvette Versus Thunderbird

An interesting conflict is taking place between the Ford Thunderbird and the Chevrolet Corvette. For 1955, the Corvette is expected to produce 185 horsepower in a V8 engine that will, it is hoped, inject life into lagging sales. Stories of being able to buy Corvettes at a discount are common.

Ford has been keeping some specifications on the Thunderbird under wraps despite much publicity and advertising.

The engine, adapted from the yet-to-be-announced 1955 Mercury, is a 292-cubic-inch V8 of about 185 horsepower (by coincidence, just what the Corvette is said to have). It has an 8.1:1 compression ratio and a top speed of 117 miles per hour.

Production is slow with about 150 Thunderbirds having been handmade by mid-October. These were not for sale, being spread around to key personnel.

The standard model will have the much-described removable plastic roof. You pay extra for a hand-operated cloth top that folds behind the seat and does not interfere with installation of the plastic hardtop.

Is the Six Done?

With the introduction of four new V8 engines this year, the six-cylinder engine becomes a rare bird indeed.

Asked about this trend, Paul Hoffman of Studebaker (it still makes the Champion L-head six) suggested that simple and easy-to-work-on engines like the Champion's may soon be worth a premium on the used-car lot. He wonders if used-car buyers want the added cost of keeping a more complex V8 engine running economically. If second-hand buyers retreat from the big V8 cars, depreciation costs on such cars will rise, he said, and this will make the six a better new-car buy also.

Two-tone paint jobs will be out-dazzled by the three-tone paint job, being introduced for 1955 on several makes. Stylists foresee a widespread use of color combinations with perhaps textile patterns in paint, Roman stripes and even polka dots decorating cars in a few years.

Headlight Development

The Automobile Manufacturers Association announces a new design for sealed-beam units that gives a longer light projection on the low beam, especially on the right side of the road. It is very effective in rain, snow or fog when the high beam often is useless. It presents less glare to oncoming drivers.

Vital to the design is a small metal cap over the filament or bulb (depending on the manufacturing system used). If the 48 states agree, there will be a midseason change-over to the light by car makers.

Although the tubeless tire has taken over for 1955, researchers say it is only the first of some startling new tire developments. Not far distant, they say, is a practically indestructible tire to last the life of the car. When that comes, the spare tire may be as unnecessary as a spare fuel pump.

Stylists love to pick an item that is accepted as fixed and make it fresh—like the shift quadrant on the steering column. In 1954, the indicator was moved into the dashboard. In 1955 the whole thing, indicator and lever both, will be in the dashboard. The taillight is also in for a freshening. It took years to blend it into the fender and now along comes a fresh look that puts it saucily atop the fender all by itself. Another styling trick for '55 is side-mounted running lights about half way back on the body—like lights on a boat or a truck.

Lumber Lift Truck Ends Hand Stacking

Chain-driven, hydraulically powered rollers mounted on the forks of a lift truck enable a load to be shifted to either side as far as desired. In lumber warehouses, where lumber is stacked with the ends facing the aisles, the equipment saves valuable time. The load is lifted the height of the stack and shoved inward by the rollers. Previously, workers had to take the boards off the lift piece by piece and finish the stacking by hand.



Portable Lift for Autos Aids Transmission Installation

One man can remove or install automatic transmissions efficiently with a hydraulic lift that has pin-point hydraulic controls. The controls permit the "inching" of the transmission into place. The lift tilts the transmission through a 98-degree arc and rotates the unit completely on its axis. It has a lifting range of from 48 to 76 $\frac{3}{4}$ inches and will not tip over even when the transmission is tilted to the fullest extent possible. The unit has a steel-tube quadruple leg base that assures maximum stability at full height under load but leaves the working area free. The unit rolls on swivel-type wheels.

Wheels and Skis Make Many Toys

Youngsters can use a new German toy as several different vehicles including a sled, scooter, wheelbarrow and ski scooter. The various parts are assembled with easy-to-remove bolts. In addition to a tubular framework, the parts include four wheels and two ski runners.

Experiments at an Army and Navy Hospital indicate very-high-frequency sound waves may reduce pain and relax arthritis patients.



Hardtop models are long, low and colorful (see cover). Scoops over the headlights are not functional



1955

1955 PONTIAC V8 SPECIFICATIONS

Wheelbase.....	Chieftain 132 in.
	Star Chief 124 in.
Over-all length.....	Chieftain 203 in.
	Star Chief 210 in.
Over-all width.....	75.4 in.
Over-all height (unloaded).....	62.5 in.
Steering ratio.....	23:1
Turning diameter.....	Chieftain 48.6 ft.
	Star Chief 43.0 ft.
Bore and stroke.....	3.75x3.25
Displacement.....	267.2 cu. in.
Compression ratio.....	8.0:1
Horsepower.....	180 at 4000 r.p.m.
Torque.....	204 at 2400 r.p.m.

EVEN THE INDIAN HEAD had to go! All new, the 1955 Pontiac replaced its famed Indian-head hood ornament with a flying V, marking the end of the straight eight. (You can still get a lighted Indian ornament, but it's an extra-cost item.)

Under the V ornament is the most important of many changes: The overhead-valve V8 with a 180-horsepower kick.

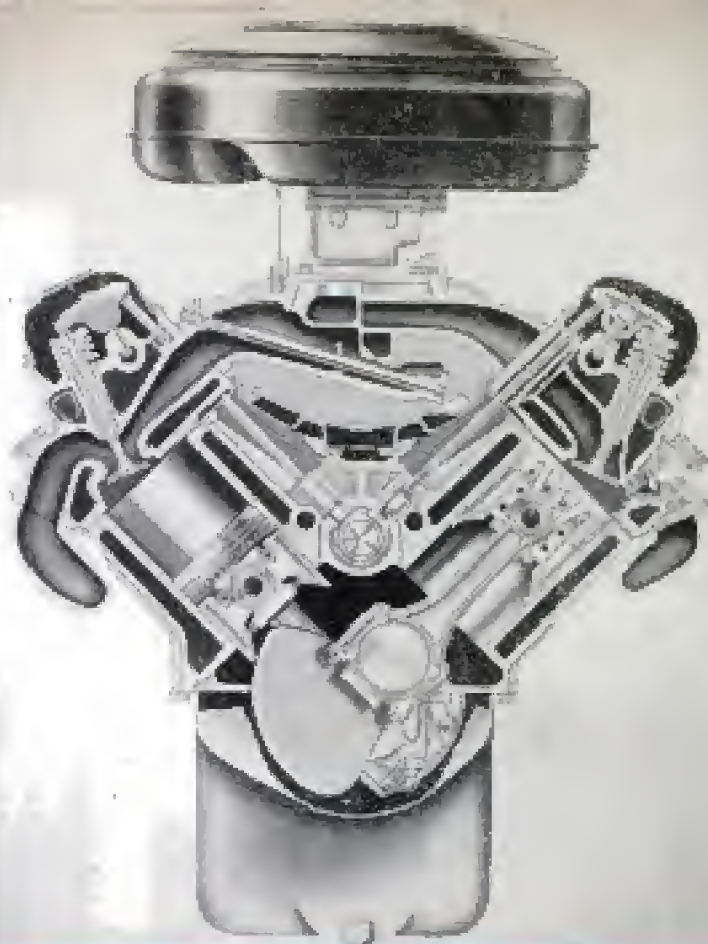
The body is all new, too. Only the Silver Streaks remain and these are modified. Two rows of them run down the lowered hood (3.7 inches under '54) from the base of the big wrap-around windshield to the bold front grille. In the rear, the streaks appear in shortened form atop each fender.

The new engine has a staggered-block design. The right-hand bank of cylinders is cast slightly forward of the left-hand bank, permitting the fuel pump to fit at the left front where it is

From the rear, it has a wider look. Note the Silver Streaks atop the fenders



Right, the new V8. Its 180 horsepower will accelerate a Chieftain from 0 to 60 in 12.65 seconds, say Pontiac engineers



Pontiac is all New

cooled by the fan to prevent vapor lock. Other features are ball-pivot valve-rocker arms that eliminate rocker-arm shafts. Each arm sits atop a pedestal and, according to Pontiac, no tappet adjustments are required—there being a built-in automatic take-up. Hydraulic valve lifters, plus a large quench area in the combustion chambers, are said to make the engine extremely quiet. A novel oil system provides pressure lubrication at both ends of valve push-rods. Two oil-filler-and-vent caps (one atop

each bank) give full crankcase ventilation.

Bodies are nearly three inches lower than last year (station wagons are 7½ inches lower and have wrap-around rear windows).

The speedometer has no needle. As speed increases, a continuous red curve moves around the dial. The more speed, the more red shows. The glove compartment is in the center of the dash and its door, when open, has two recesses stamped in it to hold cups or pop bottles safely upright.★★★



Station wagons, in two or four-door models, have a brand-new wrap-around window at rear



Simple lines feature the front-end styling of the Chevrolet. Barely visible on the cowl is the wide air intake for heater

1955 CHEVROLET SPECIFICATIONS

Wheelbase	115 in.
Estimated weight	3125 lb.
Over-all length	196.6 in.
Over-all width	74 in.
Over-all height (unloaded).....	62.1 in.
Steering ratio	35.7:1
Turning diameter	38 ft.

V8 ENGINE

Bore and stroke	3.75 x 3.00
Displacement	265 cu. in.
Compression ratio	8:1
Horsepower	162 at 4400 r.p.m.
Torque	257 at 2200 r.p.m.

6-CYLINDER ENGINES

Bore and stroke	3.56 x 3.94
Displacement	235.5 cu. in.
Compression ratio	7.5:1
Horsepower, standard	123 at 3600 r.p.m.
Powerglide	130 at 4200 r.p.m.
Torque, standard	207 at 2000 r.p.m.
Powerglide	208 at 2300 r.p.m.

New V8

Below are three models of Chevrolet's luxury line, the Bel Air



Above, the Bel Air sport coupe. Below, the Bel Air convertible



Station wagon, two or four-door, has wrap-around rear windows



POWER PLUS is what Chevrolet offers for 1955. The power is its 162-horsepower V8 engine. The plus is its optional, extra-cost, speed kit (dual exhausts and four-barrel carburetor) that boosts the V8 to 180 horsepower!

But power isn't all. Bodies are all new, too. No longer than in 1954, they look longer because of the lower styling. Wheelbase is unchanged.

Roofs have been lowered as have hoods and belt lines. Sedans are 2½ inches lower, station wagons 6 inches.

Strength has been added by a stiffer, more twist-resistant frame. Front suspension is of ball-joint design which reduces lubrication points from 16 to 4. Lengthened rear leaf springs are now outside the frame to increase stability.

Most obvious styling features are the wrap-around windshield, the simple, Ferrari-type front grille, hooded headlights.

Mechanically, Chevrolet has much to talk about. Its new V8 engine, with one of the shortest strokes in the industry (3 inches), means low piston travel per mile, an important factor in engine life and economy. Crankshafts are balanced after assembly right in the engine. So

PAY TOLL HERE



Long and sleek is the Two Ten four-door sedan. You have a choice of three engines and three transmissions

Sparks 1955 Chevrolet

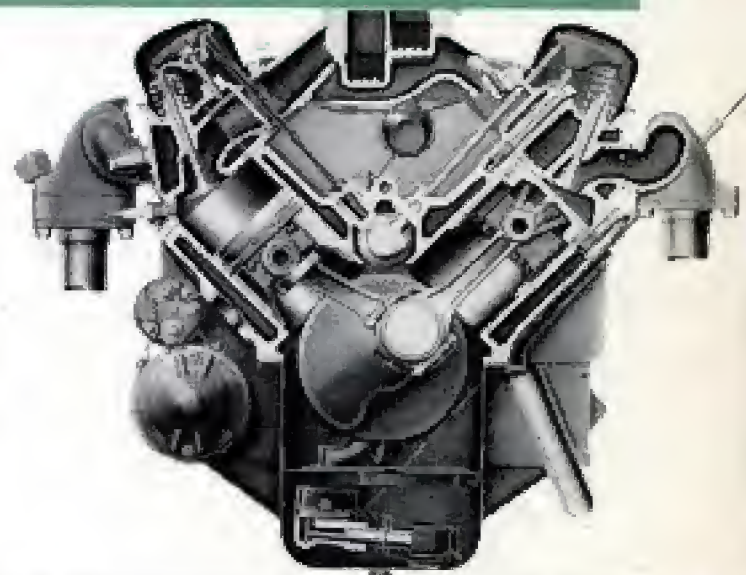
compact is the new V8 design that it takes only four quarts of oil to fill the crankcase.

Smoother power application results from replacement of the old torque-tube drive by the Hotchkiss system in which engine torque is cushioned by the rear springs.

For the first time, Chevrolet offers an optional overdrive that reduces engine speed 22 percent for added quiet and economy.

Horsepower of the six-cylinder engines is up also. The handshift model has 123 horsepower; Powerglide has 136.

Other features of all models include a 12-volt electrical system, tubeless tires, improved steering, center glove compartment, suspended brake, clutch pedals. ★ ★ ★

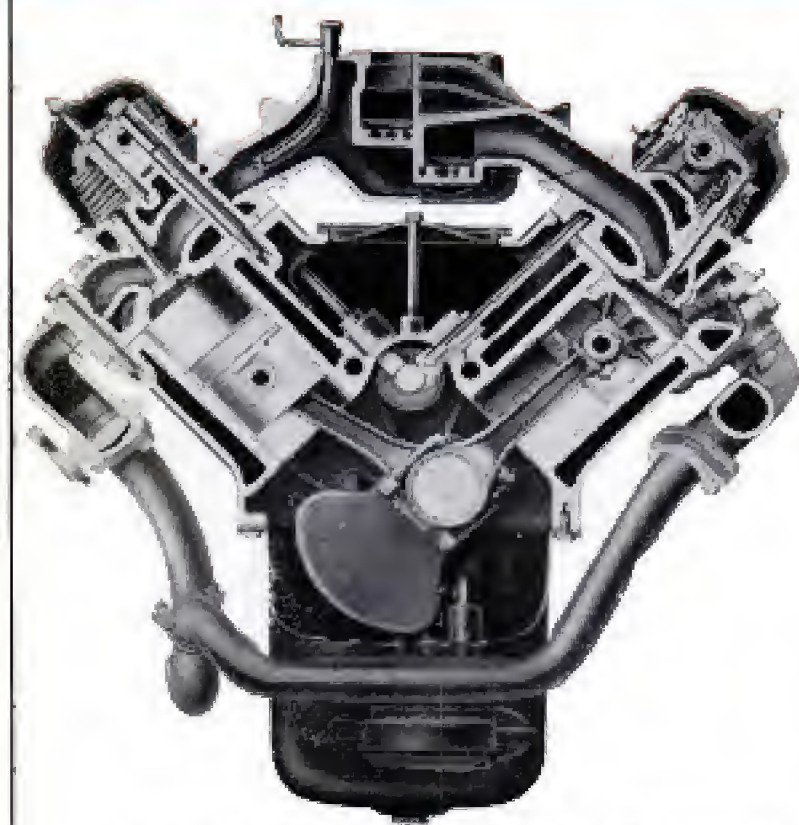


Right, the V8 engine. Below, rear styling of hardtop





Studebaker Adds New Line



Top of page is the President hardtop. Below it is the 175-horsepower V8 that is under its hood. Below, coupe models have a new armrest in the rear seat. It folds down flush with the cushion when not in use, as at left

MECHANICAL CHANGES are the big story at Studebaker along with the re-introduction of the President line.

This new President has a 175-horsepower V8 which is not, as has been rumored, adapted from the Packard V8. It is Studebaker's own.

The 1955 Commander has the industry's shortest-stroke V8, it being only 2.813 inches (the 1954 Commander had a 3.25-inch stroke). It now develops 140 horsepower.

Still retaining the L-head inline six, the Champion has had a horsepower jump to 101. Stroke is increased to 4.375 inches (in 1954 it was 4 inches).

Stylewise, Studebaker has been face-lifted with a new front-end treatment, chrome trim and taillights.

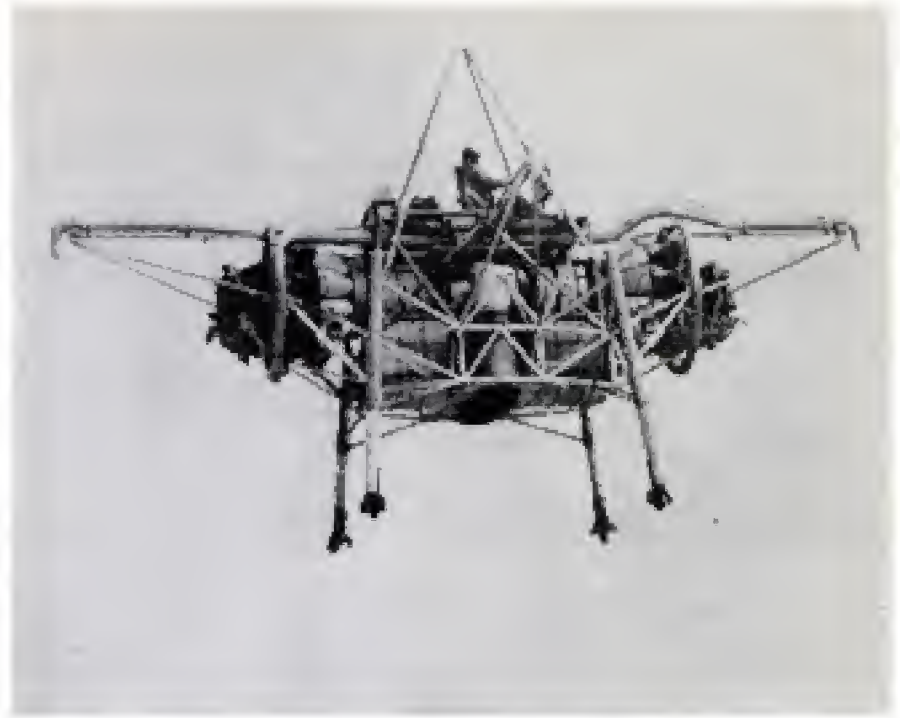
Low-gear starts in all Automatic Drive models now assure faster get-aways. Gears shift automatically and lock into economical direct drive. President models have four-barrel carburetors.

Price cuts on all models have been announced, bringing the Commander into the range of such low-price V8s as Ford, Chevrolet and Plymouth. ★ ★ ★



"Flying Bedstead" Goes Straight Up

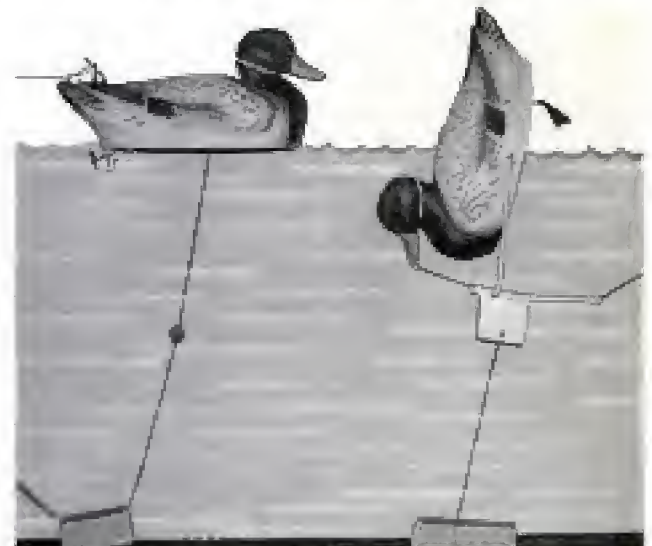
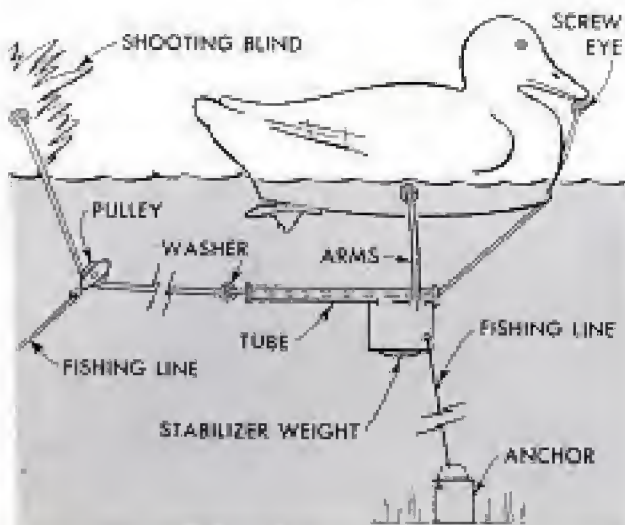
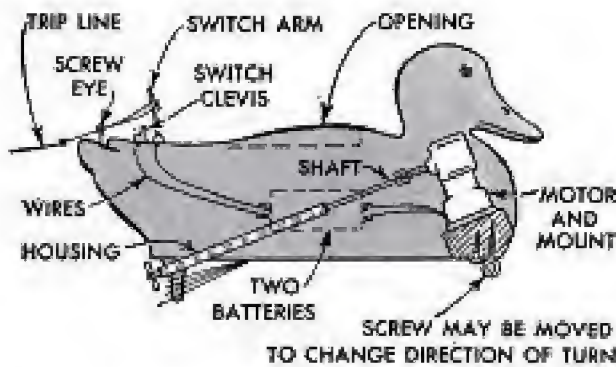
There are no wings on the "Flying Bedstead," an experimental aircraft made in Britain. Designed for vertical take-off, it consists of two turbojet engines mounted on a tubular-steel frame. The pilot sits in the middle of the framework, above the engines, and directs his craft by directing air streams from the jets. Most vertical take-off designs leave the ground with the pilot's feet above his head, but in this he remains in a normal seated position at all times.



Powered Decoys Swim and Dive Around Hunter's Blind to Fool Ducks

Duck hunters and ducks don't always get together, frequently because the hunter's motionless decoys don't fool the wily birds. Thomas Paladino of Conway, Ark., tried pulling decoys with strings and powering them with rubber bands. Finally he came to the conclusion that a self-powered decoy was the only kind that would fool a duck. The result is two new decoys, one

that paddles around the blind and another that actually lifts its tail and ducks for the ducks. The swimming model is powered by a motor operated by two flashlight batteries. The motor turns a propeller which moves the decoy through the water for 1½ hours before the batteries have to be replaced. The decoy is tied to a weight with fishing line and swims in a circle. A switch on the tail, operated by another length of line, permits the hunter to start and stop the motor. A de luxe model is operated by a six-volt battery, with an extension cord running from the blind to the decoy. The ducking decoy has no motor, but is operated by a line which runs from the decoy's bill through a stabilizer weight beneath the water, over a pulley near the hunter and into the blind. The stabilizer is anchored to the bottom of the river or pond. When the hunter pulls the line, the decoy ducks.





Each of the bales at left, not much larger than a bale of hay, represents a scrapped car pounded by the press

ONE-TWO-THREE

By Gerald R. Hunter





Old auto, engine and all, is dropped into the maw of the press. In seconds it will emerge as a little bale

PUNCH REDUCES AUTOS TO BALES

A MONSTER so powerful that it gives even its hardened operators the creeps now is punching scrapped autos into bales.

The machine, in three, simple, horrifying strokes reduces an entire automobile or truck—engine included—into a 2500-pound chunk of steel about the size of a street-corner mailbox.

The press weighs 675,000 pounds and will wad up 45 tons per hour of autos, tricycles, dull lawnmowers or old razor blades. The Chicago Auto Wrecking Corporation, which bought the prototype, is using it only to massacre old cars. The press was built by the Harris Foundry & Machine Company.

Five 100-horsepower motors, each designed to deliver a peak load of 160 horsepower, give the press its tremendous punch. They actuate 10 pumps, each of which delivers 55 gallons of hydraulic fluid per minute at 2000 pounds per square inch.

Spectators gasp when a scrapped automobile is dropped into the maw of the huge

press. Without apparent effort the first compression, or gatherer, ram pushes the whole automobile up under the vertical compression, or trampler, ram in such a way that the car is reduced in length from about 20 feet to 5 feet. The car collapses like a concertina. Then while the compression ram holds the shortened vehicle in position, the trampler ram comes down and flattens it to a height of 24 inches. And with both compression and trampler rams extended, the ejector ram slams in for the third and final punch that squeezes the bale into its final size of about 60 by 24 by 24 inches. A separate stroke of the ejector ram knocks the little 2500-pound bale from the press.

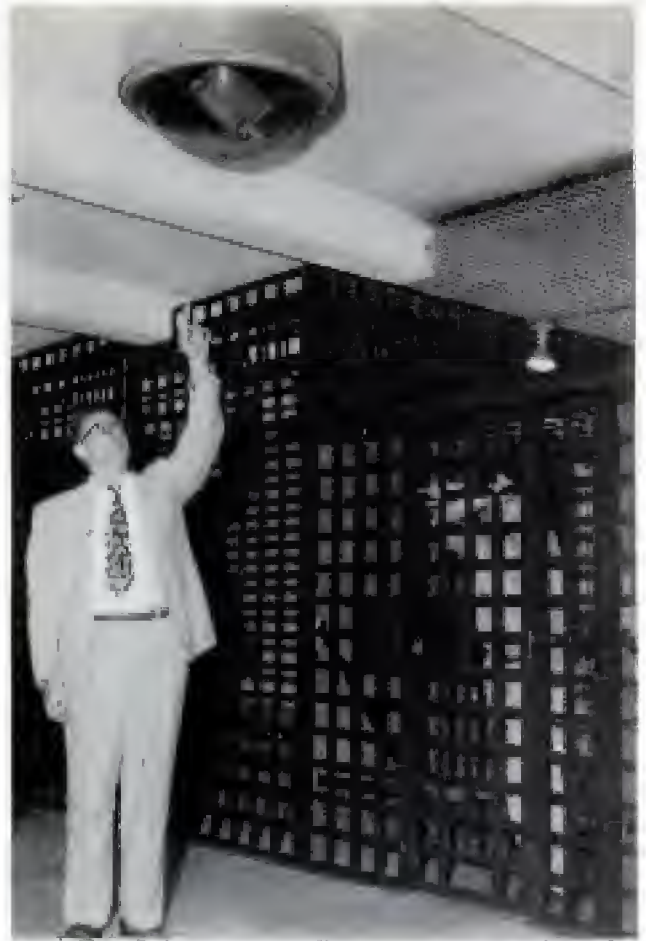
The size of the finished bale depends somewhat upon the size of the original car; a big, heavy car makes a bale slightly larger than a light car.

It's quite possible that your 1956 model car, stove, refrigerator or other steel product will have its start in the crunching maw of the big press. ★ ★ ★



TV Cameras Watch Prisoners

Television cameras replace guards in the Redlands, Calif., jail. Three receivers before the desk sergeant show what's happening in the group cell, assembly room and cell block. Another set is in the police chief's office. Each camera is operated remotely and can cover an entire area. The



group-cell camera has a wide-angle lens, while the other two swivel to pan 360 degrees horizontally, 45 degrees downward.

Versatile Short-Wave Marine Radar Can Do Four Different Jobs

Four different jobs are done by a new short-range sound radar system, designed to supplement long-range equipment and for use by boatowners without conventional radar. At one selector-switch setting a high-pitched tone is sent out which echoes or reflects from obstructions in its path up to one third of a mile. The distance of the object is indicated by the time lapse

between the sending and receiving. When at the "talk listen" setting, the loudspeaker becomes a sensitive microphone which picks up sounds seven times farther away than can be heard by the unaided ear. By pressing a switch on the microphone and using a normal voice, the speaker will greatly magnify the sound. Final switch position activates whistle or foghorn.



German Soapbox Racer Has Plastic Body

Clear plastic forms the body of a soapbox racer built by a German firm. Displayed at an international fair at Frankfurt, it is powered by foot pedals. Steered like a full-size automobile and equipped with a hand brake, the little racing car sells for about \$45.

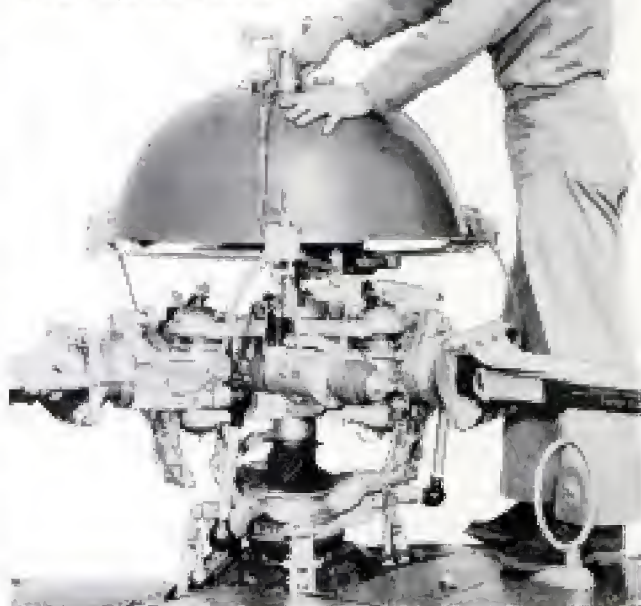
British scientists report an experiment in which they froze hamsters to 23 degrees below zero for 40 minutes, and in less than two hours the animals were walking again.

Helicopter Gets Power Boost From Rockets

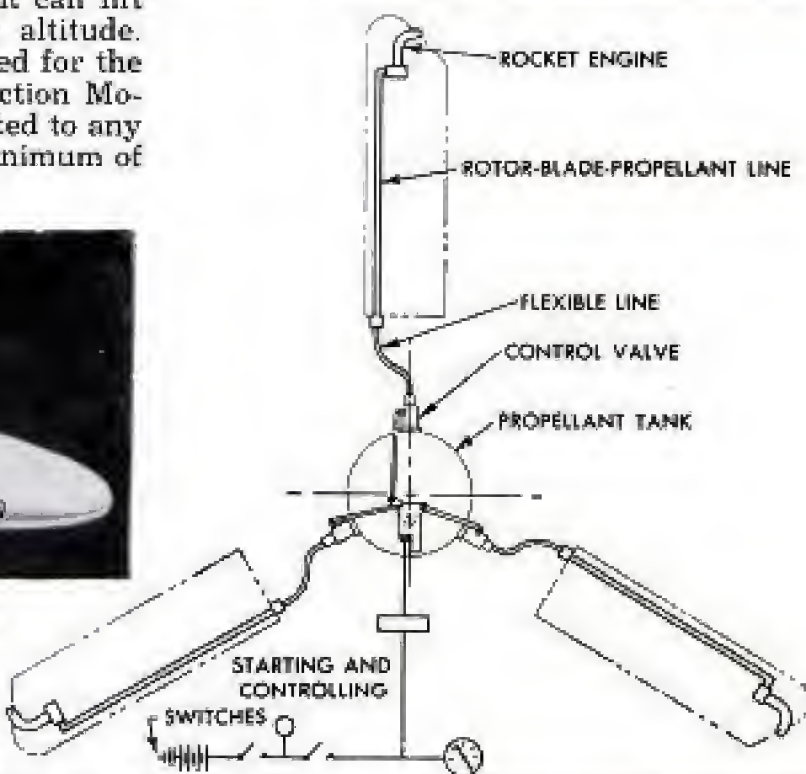
TINY ROCKET ENGINES mounted on the rotor tips and using hydrogen peroxide as fuel give the Marine Corps' HRS-2 helicopter enough take-off power to double its payload under certain conditions. The rocket engines themselves weigh only about one pound each, and the entire system, including the dome-shaped fuel tank mounted on the rotor, fuel lines and controls, weighs but 67 pounds. Since the fuel capacity of the tank allows a maximum of but seven minutes' operation, the rocket assist is designed primarily to give the helicopter a power boost at the moment of take-off, although it can be used to increase hovering ability or gliding distance in the event of failure of the main power plant.

The rocket-assist system is particularly valuable at higher altitudes. A helicopter capable of evacuating six men at sea level normally could pick up only three at 5000 feet. With added rocket power, it can lift its sea-level load at the higher altitude. Although the system was designed for the Sikorsky HRS-2, its maker, Reaction Motors, Inc., say that it can be adapted to any helicopter in operation with a minimum of change.

Dome-shaped tank on rotor holds special rocket fuel



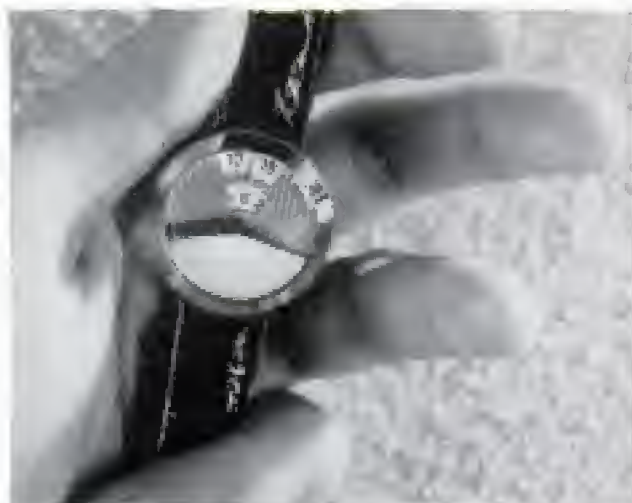
Except for pilot's controls, mechanism is mounted entirely on rotor (diagram, right). The small rocket engine rides inside stream-lined rotor-tip fairing (above). Rocket exhaust, which provides thrust, is practically invisible and almost silent



Mock-Up Watches Tell Time, Date and Radioactivity Level



Spectrum dial on "atomic" watch would indicate the radioactivity of area. Wrist piece also mounts a standard watch and a calendar. Below, FM wrist radio would receive time signals at five-second intervals



Rotating disks may replace hour and minute hands. The time on this watch is 6:12. Direct-reading watch below has smaller windows but white dials outlined in black are easier to see and give precise time



Following Detroit's lead, one watch company is exhibiting its own futuristic dream models. Like most dream cars, these "watches of the future" are not for production and do not actually work. One warns the wearer against radioactivity, in addi-



tion to telling the time and date. Others have circling disks which show the time through a small window in the face. One is a transistorized wrist radio which would receive time signals broadcast by special FM stations.



Rubber Barricade

Rubber traffic markers have proved to be life-savers on a boulevard in Cuyahoga Falls, Ohio. Steel rail sections formerly used to protect the park strip and designate traffic lanes caused fatal auto accidents. Recently the rails were replaced with large rubber pipe sections set in concrete. Since then, the posts have been hit many times, but no accidents or car damage have been reported.

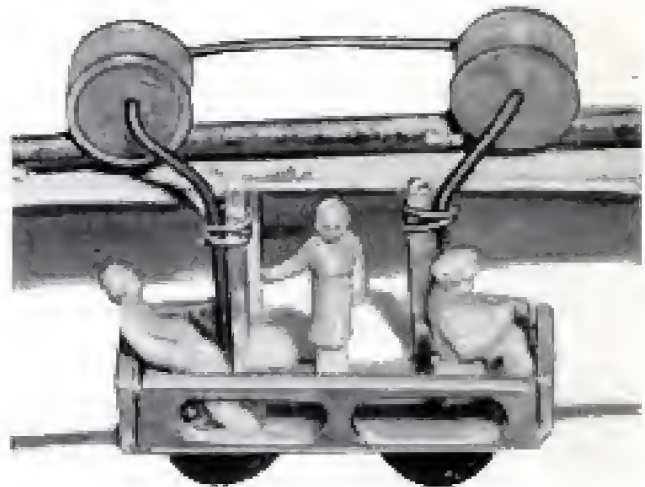


Large inner court with swimming pool in center will be feature of circular building, here shown in a model

Monorail Passenger Car Takes Place of Elevator

Instead of an elevator, a two-story circular building to be erected in Miami will have a "circulator." This will be a modified monorail car which will travel around the second-floor balcony on the inner side of the building. Push buttons will control the electrically driven car so that it can be returned to any point in the circle. An automobile chassis will be used to make the car, which will have rubber-tired wheels, two running on the rail and two against the wall of the building. The building, which will house an optical school and a scientific club, will have an outer circumference of 1000 feet and an open court in the center.

Crude model of monorail car shows its basic design, with two wheels on rail, two riding against the wall



Mobile Centrifugal Irrigation Pump

Crops and pastures are irrigated with a four-inch centrifugal pump that is pulled behind a tractor and driven by the power take-off. The mobile pump, rolling on rubber tires, comes as a complete unit ready to run. The pump can be used with any 20 to 30-horsepower tractor and delivers one inch of water to an acre in an hour. It is equipped with a built-in speed increase and a hand-operated priming pump.



DASH LIGHT appears to be a telephone receiver, is actually a handy flashlight that plugs into cigar lighter. It serves as a trouble light or as a baby spotlight.
Hichter Co., 808 E. 19th St., Los Angeles 12, Calif.



DO YOUR CHRISTMAS SHOPPING HERE-DO



STEREO CAMERA features low cost, four shutter speeds, automatic exposure adjustments, distance indicator and spirit level. It is loaded with a film magazine.
Eastman Kodak Co., Rochester 4, N. Y.

BARBECUER portable enough to be taken on camping trips gives smoky flavor to meats and offers positive smoke and fire control. The barbecue uses little charcoal.
Old Smokey Mfg. Co., 3023 Tilden St., Houston, Tex.

JUICER supplies glassful of vegetable or fruit juice in only a few seconds. Juice contains no pulp. Cut fruit and vegetables are dropped in, automatic feed does rest.
Sweden Freezer Sales Corp., Juicer Division, Seattle 39, Wash.





WALLET that fits on car sun visor has big Zipper pocket for maps and papers, a case for sunglasses and a notebook for addresses and mileage reports
 Pam Sales Co., 8915 Lake Ave., Cleveland 2, Ohio

ELECTRIC WHEEL CHAIR can turn sharply, go anywhere. One lever operates all controls. Batteries are charged by plugging unit into electrical outlet
 Sears, Roebuck and Co., 925 S. Wabash Ave., Chicago 7



YOUR CHRISTMAS SHOPPING HERE-DO YOU

NO STAMP NEEDED
 PARCEL POST
 AIR PARCEL POST

FOR DEPOSIT ONLY
 PLEASE BEWIL
 DO NOT BEWIL
 SPECIAL MARKING

SPECIAL DELIVERY
 FIRST CLASS MAIL
 REGISTERED
 VIA AIR MAIL



RUBBER STAMP mounts the 12 most-used markings for packages. A twist of key puts right stamp in position. Imprints are 1/4 in. high, 1 1/2 in. wide
 Postal Press, 3814 West Glen Blvd., Los Angeles 35, Calif.



CLOTHES ROD can be hung in seconds from hooks in car. It telescopes for installation or removal. Clothes can be carried to and from car in position
 Venture Enterprises, 2875 Paloma Drive, Ventura, Calif.

BASEBALL GAME has plunger-operated pitching device that throws curves or straight balls. Balls are batted into squares marked for hits, outs and fouls
 Ideal Toy Company Co., Franklin, Ill.





CAMPER'S RANGE fueled with gasoline fits into any car trunk, has two burners and contains cooking and serving utensils for four diners. Weight is below 34 pounds

Phison Co., 708-K E. 11th St., Kansas City 8, Mo.

STEREO CAMERA for amateurs has a fixed focus, single speed, is loaded with a film magazine. Camera comes in kit with shoulder strap, carrying case and viewer

Linex Div. of Monel Corp., 15 E. 20th St., New York

DO YOUR CHRISTMAS SHOPPING HERE-DO

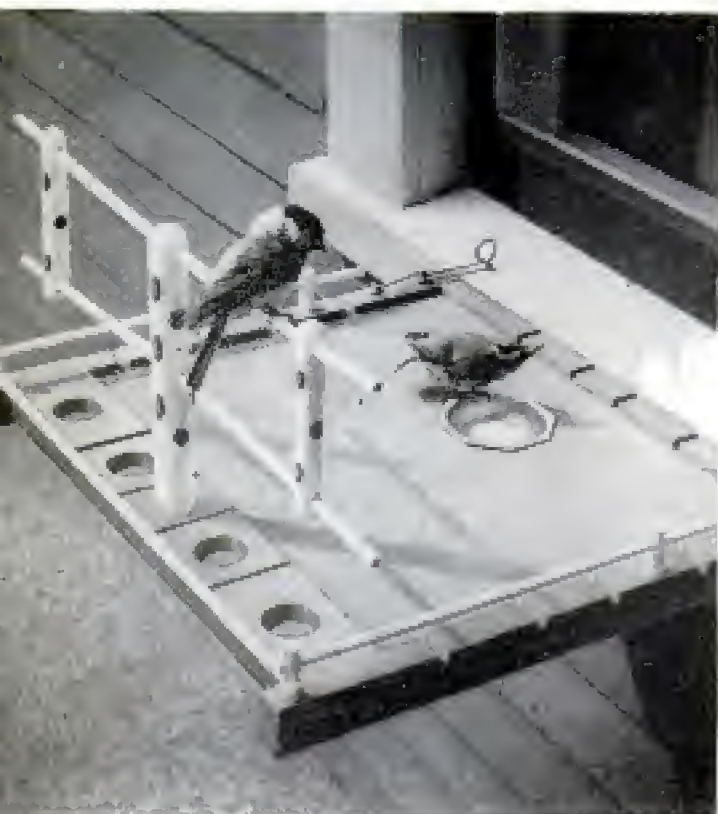


FEED STATION for birds attaches to window sill without use of tools, allows you to watch and feed birds easily. Unit has perches, drinking and feeding cups

Dunrobit, Dutch Ridge, Pennsylvania, N. H.

CAMERA that delivers a finished print in 60 seconds is smaller and less costly than its predecessor. Wallet-size photos from it cost less than standard pictures

Polaroid Corp., Cambridge 32, Mass.





PICNIC SET allows you to carry in one hand a full meal for six or eight. Five aluminum pans filled with food, tableware and paper plates lock into each other to become one package. Bottom pan is a skillet
 Buckeye Aluminum Co., Wapakoneta, Ohio

TOY TUBA made of lightweight plastic plays real music, is easy to blow and withstands rough handling by youngsters. Push buttons control eight hand-tuned valves. Instrument is three feet high, golden plated
 Emcee Industries, Inc., 200 Fifth Ave., New York 10

YOUR CHRISTMAS SHOP



TOOL CART for transporting lawn and garden equipment holds rakes, hoes, shovels, small tools
 Gem Toys, Inc., 702 Todd St., Azusa, Calif.

FISH SCALER is part of a power-tool kit for cleaning and sharpening fishing gear
 C-D Products, Inc., 3840 Willow Rd., South Park, Ill.

CABINET for small objects has clear-plastic drawers that swing out

Akro-31119, Inc., 820 E. Market St., Akron 6, Ohio





BRUSHES of water-color set have reservoirs in handles, do not require messy dipping. Water and a coloring tablet in each handle combine to produce paint. Pictures to be painted go with set

Keener Products Co., 912 Syracuse St., Cincinnati 2, Ohio

STAR PROJECTOR turns a small room into a planetarium. Light in globe shines through holes in shell, casting "stars" on wall or ceiling. The easily adjusted toy duplicates 40 constellations

Harmonic Reed Corp., Bensalem, Pa.

DO YOUR CHRISTMAS SHOPPING HERE-DO



MONORAIL toy train zips along single track. Flashlight batteries and an electric motor power the plastic, streamlined car. Nonpowered cars and additional tower and track can be added

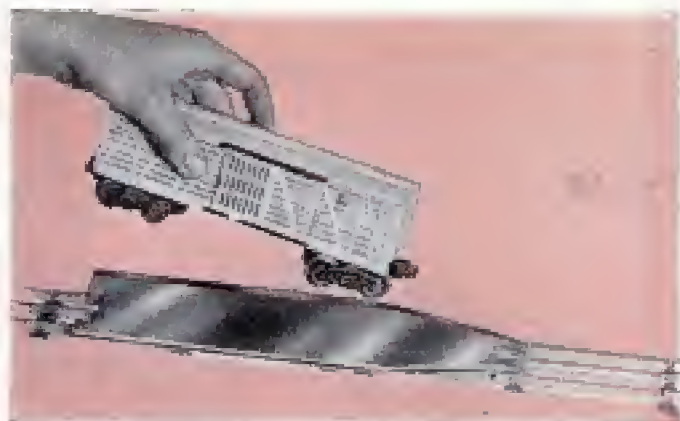
Northrup Products, Inc., 915 Meridian, South Pasadena, Calif.



SHOCK ABSORBER for bicycle prevents any jarring action from being transmitted to frame and handle bars

Evans Products Co., Plymouth, Mich.





RERAILER for model trains simplifies the task of placing cars on tracks when setting up or after derailment. It lies on tracks, acts as chute
General Machining Works, 214 W. Grand Ave., Chicago 10

CLOTHES HANGER shaped like a dog is made of perforated hardboard, with leather ears and tail and a plastic eye. Hooks fit perforations
Robert J. Bender, 410 S. Jefferson St., Chicago 7



YOUR CHRISTMAS SHOPPING HERE-DO YOU

"RADIO" set transmits voice and code over two telephones up to a half mile away, has a toy station with signal searchlight
Remco Industries, Inc., Newark, N. J.

SWING in the form of a hobby horse is safe for small children. Rowing motion by child sends swing up into air. The seat is always level; swing hangs from three chains
E. Burke Co., Van Dyne Bld., Fond du Lac, Wis.

TV EARPHONES let children listen to noisy programs parents don't hear. Headset has antenna and 12-foot cord
Hofmann Radio Corp., 820 Atlantic, Kansas City, Mo.





Inflatable Sneakers for Mine Fields Distribute Weight Safely

Members of the British Royal Engineers are experimenting with inflatable sneakers for use in mine fields. The huge supports are inflated like toy balloons by the wearer.

When he's sweeping for land mines, they distribute his weight over such a large area that he won't trip a land mine even if he steps on one—it's hoped.

Last Gasp of the Steam Locomotive Here, But Not in Britain

Steam locomotives may have reached the end of the line in the United States, but not in Britain. The first of 20 new steam-powered freight locomotives has been delivered to the British Railways. They will be used primarily for mining hauls. The

coupled wheels are five feet in diameter and locomotive and tender measure 55 feet 11 inches long. Boiler pressure is 250 pounds per square inch. In 1953, for the first time in 125 years, not one U.S. railroad ordered a steam locomotive.





Drugged Pack Horses Take Plane Ride

Even pack horses are riding airplanes these days. Recently the Montana Fish and Game Department flew three of them over the Continental Divide to a remote wilderness lake. The horses were needed to carry out spawn of the black-spot native trout, but it would have taken many days to trail them in. An ancient Ford tri-motor plane was used, for it was the only craft that could carry a load over the Divide and land safely on the tiny U.S. Forest Service landing strip provided. The horses were "knocked out" with intravenous injections of chloral hydrate, rolled in canvas and swung into the plane for the 60-mile trip. Two trips were made. One of the horses came out from under the anesthetic during the first trip and a wild



scramble ensued. The cabin was not big enough for the frightened pony to stand in and the 25-year-old plane was seriously endangered. After the horses were landed, they were placed in the propeller wash from the airplane and quickly revived.



Truck-Mounted Arm Loads Hay Bales

Attached to the side of a truck or wagon, a mechanical arm picks up hay bales, swings them in a big arc and drops them gently in the bed of the vehicle. No source of power is required to operate the implement, as it works off a power wheel rolling along the ground. As the loader approaches the bale, a guide on a small caster wheel turns the bale into line so it will slide into the rear pick-up fork. The front fork then descends to clamp the bale securely, and the lifting arm hoists it through the air to the truck bed, where it is released. The arm then returns to the ground, ready to receive another bale. The loader is attached by dropping a bolt into a clevis welded to the truck or wagon. It can be operated in gullies, irrigation ditches and on hillsides.



Although Copeman has made over \$1,000,000 on a single invention, he still likes to putter in his workshop

FIFTY YEARS AN INVENTOR

His name may be less renowned than Edison, but millions of housewives and their husbands thank Lloyd Copeman for a lifetime of ideas

By Anita K. Clever

THE MAN worried the heel of one glazed rubber boot with the toe of the other. Wherever the toe pressed, thin ice cracked and flipped to the ground.

Thus was born to Lloyd Groff Copeman a million-dollar brainchild, the rubber ice-cube tray for refrigerators. Copeman had been gathering sap "just for the fun of it," and slush collected and gradually froze on his boots. When he returned from the jaunt he sat down and dreamily regarded his footwear, an act of contemplation which led to the ice-cube-tray idea. It was one of many to be conceived by Copeman which would ease the daily burdens of the housewife and others.

This is the story behind the important

inventions of a man who admits "some of my neighbors are certain I'm balmy." A distinguished-looking, white-haired man from Metamora, Mich., Copeman's memory at 71 is one of his outstanding traits.

Immediately after the tray idea came to him, Copeman told his attorney to prepare patent applications for three types of rubber trays—one for a complete rubber tray, one for a tray with just rubber section separators and one with individual, removable cube holders. That night Copeman traveled to New York City on other business, and asked the use of his hotel's refrigerator in which he put small rubber caps filled with water. Next morning, after amusing himself by flipping the cubes out of them,



he elatedly wired his attorney to submit the application for the all-rubber tray.

The nation's ice-cube consumers avidly accepted Copeman's tray idea and the invention proceeded to gross more than a million dollars in royalties.

Copeman's inventions range from items as indispensable to the modern housewife as the electric stove to a process used throughout the world for greasing automobile bearings.

The electric stove evolved from a thermostat he had invented which provided automatic warning when transformer stations for high-tension wires were about to burn out.

In those days of 1906, some women practiced the art of cooking in what was known as a "fireless cooker." This was an awkward wooden box which enclosed heated soapstones over which pans of food were placed. Copeman applied the idea of his transformer thermostat to a fireless cooker and substituted electrical units for the soapstones.

A few years later, Copeman and the late J. D. Dort, automotive pioneer, established in Flint, Mich., the Copeman Electric Stove Company. It began in 1912 with 22 stockholders and was a \$500,000 enterprise.

Residents of the carriage-manufacturing town of Flint may have been favorably impressed with Copeman's stove—not so the rest of the country. The electric range, unlike the rubber tray, was not swiftly fastened upon by the housewife.

One day he sat glumly alone in a booth at a Philadelphia convention where various manufacturers were demonstrating their products before potential distributors. He had been undisturbed all day by a single distributor. But now, approaching before his almost unbelieving eyes, was a handsome, elderly gentleman, who stopped and expressed interest in Copeman's stove.

"And how are you doing with your product, young man?" the gentleman inquired of the inventor.

"Well, we've got a good product, but darned poor sales organization—that's me," Copeman said.

"We have a good sales organization and no likely cooking product," the man replied. He was president of Westinghouse Electric Corporation.

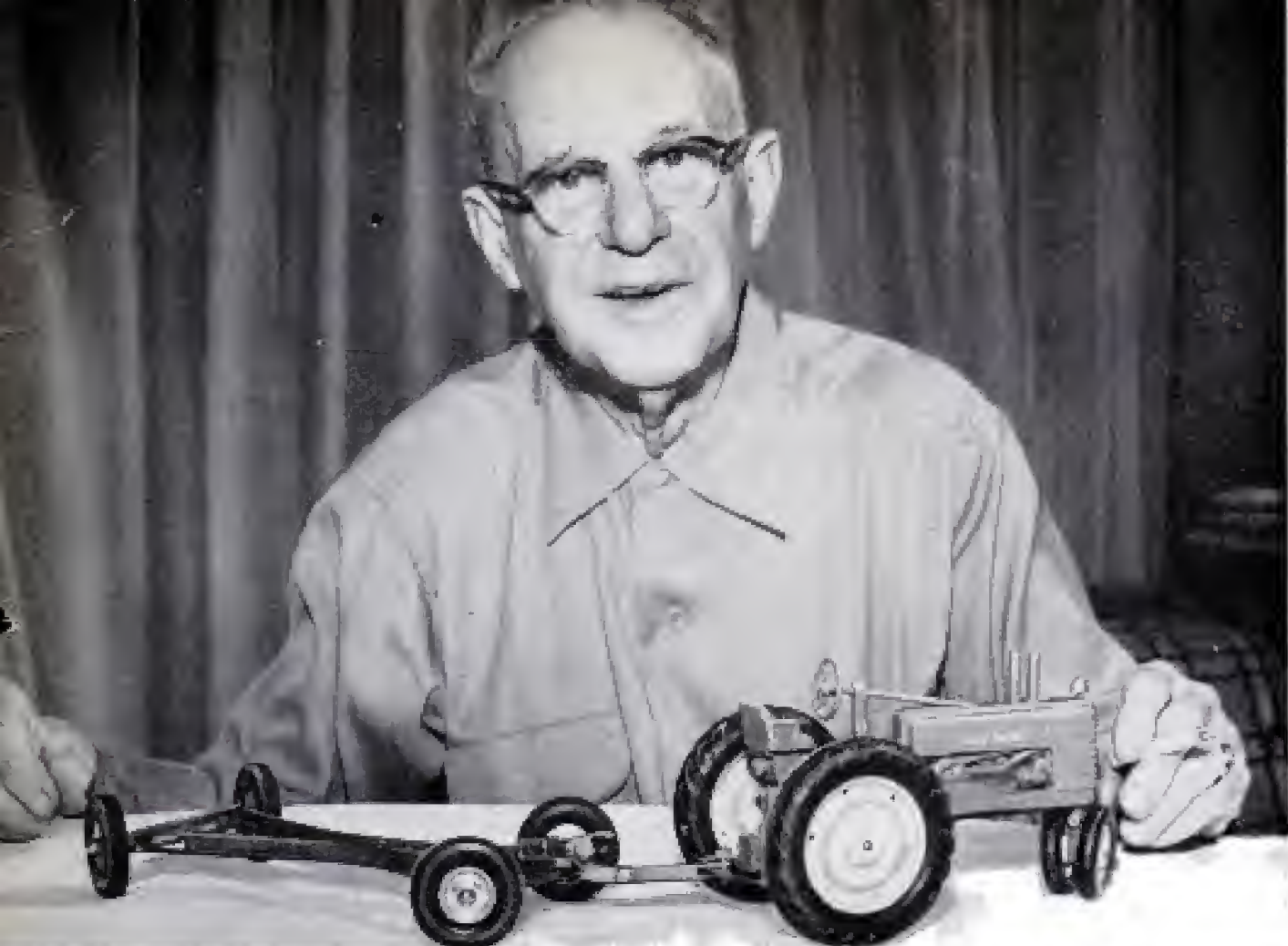
In a few days, a deal was made in which



Copeman got the idea for the rubber ice-cube tray from a rubber boat which easily shed ice coating

A recent invention is this hood for paint cans that catches drippings and keeps rims clean for resealing





Special gear for trailer permits rear wheels to turn for balanced carriage of load; it locks for normal use

the Copeman stove company was absorbed by Westinghouse. The year was 1918.

One of the inventor's first money-making products was developed in 1900. It was a cauterizing instrument for surgery. Another invention which never amounted to much financially, but which certainly has a practical value, is his flexible-rubber clothesline for indoors. The clothesline is about a foot long and is of three strands of braided tube rubber. This stretches to eight feet and articles of clothing are clamped between the strands until they dry.

A number of his inventions were born as a result of his having spent most of his life in one of the biggest centers of automobile production in the world. Some of them died there, too. One which thrived and is used today throughout the world is a high-pressure system for forcing grease into automobile bearings. This idea was sold in its infancy for \$178,800.

Another ingenious and work-saving device that Copeman invented was the result of an idea born, quite naturally, with the help of his wife. The two were window shopping and she spotted a toaster.

"Why don't you invent a toaster that turns the toast automatically?" she asked casually.

So he did. He employed a knob and rack

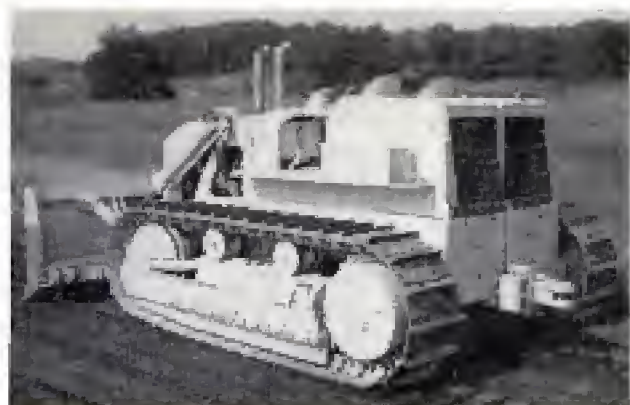
device which turned the bread without making it necessary to touch it. This was the first automatic toaster, forerunner of the pop-up toaster of today.

One of Copeman's ideas, which has been extremely valuable to his fellowmen and is used in countless ways, is his application of latex, as acquired in its liquid form from trees. Copeman discovered that this product, when applied to paper, forms a cold, strong adhesive which sticks to itself but to nothing else.

Copeman is presently awaiting word on the value of latex as used in a possible tamperproof envelope for the government. The envelope cannot be opened without tearing the message. Another use of latex is a protective paper covering for auto parts in shipment.

Among his other patented inventions is a refrigeration process used by meat delivery trucks. In this, Dry Ice is melted in a nonfreezing-liquid bath and the resulting gas forces the chilled liquid through tubes in the truck. He also dreamed up a paint-can hood to keep the top of the can clean so the cover can be fastened tightly after using only part of the paint. This one is not yet in production.

Copeman has many more inventions up his ingenious sleeves. After all, he figures, you can't let the neighbors down. ★ ★ ★



Separate Engines Power Left and Right Tracks of Tractor

Each track of a new crawler-type tractor is powered by its own diesel engine. The engines are mounted side by side in front of the operator, with their radiators located in the rear to minimize dust and heat around the driver's seat. Each of the 190-horsepower engines transmits power to its

own track through a torque-converter transmission. All shifting is accomplished under full power, and the tractor can be shifted from one speed range to another without loss of motion. The top speed is eight miles per hour. The tractor is steered by varying the speeds of the two engines.



Proposed Television Sets Would Feature Thin Screens

Your TV-picture screen in 1964 may be so thin that it can be hung like a painting on the wall or mounted like a vanity mirror in a table model. That's the prediction of General Electric scientists. The circuitry would be built into the picture frame and would use printed wiring and miniature components. Closely spaced wire grids would luminesce at their intersections to reproduce the transmitted picture. The futuristic TV set was suggested by work on an aircraft plotting system that will automatically transfer radar information to a picture screen.

Home Battery Charger Serves Double Purpose

Auto and marine batteries are kept at top efficiency by a charger that delivers six amperes until the full charge is reached. Then it automatically switches over to a low-charging "battery saver" circuit that maintains a full charge over weeks or months. One plug of the charger connects to a standard electrical outlet while another plug fits into the cigar lighter on the car's dashboard. The compact charger is easily carried and is simple and economical to operate. A single push button begins the charge. The rest is automatic.

☛ Nearly 700 diesel-powered taxicabs went into service in London during the first half of 1954.





The A-shaped net not only catches the smelt when properly cast, but provides a storage pouch at one end

Tricky A-Nets Land Surf Smelt

ALONG THE COAST extending from southern Alaska to northern California an unusual brand of smelt is caught in an unusual manner. The surf smelt, which has the unique habit of spawning in the surf in small coves, is captured in large quantities in A-nets. These nets are in the shape of an A with a crossbar to complete the letter. A thin-meshed, baggy net is attached and the net is dipped into the surf large end down. The fisherman wields the net with one hand on the crossbar and the other on the pointed end.

There is a definite knack required to make a good catch. If the fisherman does not meet the wave as it breaks and rolls

Fishermen must lift A-nets quickly after dipping into the surf or the elusive smelt will get away

over the beach, the fish move in, spawn in an instant and are going out to deep water again. The experienced netter learns a few practical tricks such as dipping his net at just the right moment, then lifting it quickly into the air above the water. If he lands any surf smelt—one dip usually yields from two or three to a dozen—the fisherman works the catch down to the small end of the net, forming a little bag over which he closes his hand. This enables him to keep his catch until he has enough to take ashore and put into a bucket. The spawning season is from early summer to late fall, but the elusive smelt come and go in their own mysterious way.

Green and silver smelt average six inches in length and are very tasty. Coast limit is 25 pounds a day



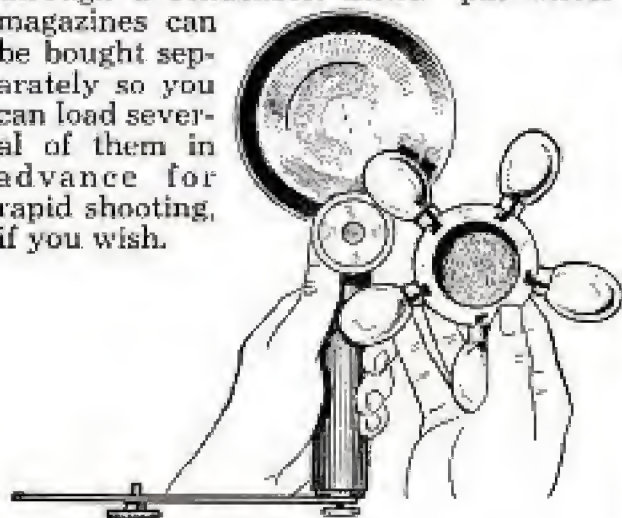


Paste Made From Cactus Roots Cleans Books and Wallpaper

Ground cactus roots make up a new detergent that cleans book pages without causing them to stick together. It's also a fast-acting cleanser for Venetian blinds, wallpaper, mirrors and furniture. Harmless to the hands, it contains a powder base and is supplied in the form of a paste which is diluted with eight parts of water for normal use.

Photoflash "Pin Wheel" For Rapid-Fire Shots

Photographers can shoot five flash shots in a hurry when their cameras are equipped with a turret-type flash gun. A revolving magazine holds up to five bayonet-base bulbs. After each shot, the photographer merely turns a fresh bulb upright. Or, if he wants a trick effect, he can spin the magazine with the shutter open for a multiple exposure. The unit fits any camera equipped with a synchronized shutter and uses a 22½-volt battery, firing through a condenser. Extra "pin wheel" magazines can be bought separately so you can load several of them in advance for rapid shooting, if you wish.



NOVEMBER 1954



Portable X-Ray Unit Needs No Electricity

Only \$40 worth of materials was required to make a little X-ray unit that produces rays comparable to those of a 100,000-volt X-ray machine. The simple, portable device contains radioactive thulium and does not require electricity. Developed by the Atomic Energy Commission's Argonne Laboratory, it may be used for X-ray photography in industry, for medical purposes in remote areas and in Army field hospitals.

Plastic Pennants Aid Sailors

Plastic pennants for sailboats make it easy for amateur yachtsmen to keep their craft in the "wind's eye." A one-ounce lead weight on each pennant staff keeps it always perpendicular, no matter how high the boat is heeling. Used in pairs, the sensitive wind indicators are fastened to the mast at right angles to the centerline.



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Built to carry bombs, the B-17's fuselage is almost filled by the eight interconnected insecticide tanks



In addition to the huge tanks inside the plane, there are two F-94 jet wing tanks suspended under the fuselage. Between them can be seen the center spray bar. Below, there is also a spray bar under each wing. Propeller wash helps spread insecticide



Bomber Battles Bugs

SPRAYING 150 ACRES of land per minute, a huge four-engine B-17 is said to be the world's largest insect-spray plane. At the end of World War II, the plane ended up in a Stuttgart, Ark., park as a war memorial. Bought by two brothers, Max and John Biegert of Shickley, Neb., the B-17 was completely refitted. The change-over from bombing in war to "bug bombing" in peace took 13 months and \$80,000. The Biegerts are no novices at the business as they have been spraying from airplanes for eight years. Heretofore, however, they have always used the conventional, small single-engine plane. Three spray bars release a 500-foot swath of spray. With four engines whipping the spray, the plane lays down a mist upon 150 acres per minute. Two tanks under the fuselage and eight more inside the plane provide space for hauling 3000 gallons of insecticide. In operation, the plane flies at 150 feet altitude and 160 miles per hour.

Desk-Top "Brain" Costs \$48,000

For just \$48,000 you can buy a desk-top electronic computer that stores 2048 words in its magnetic-drum memory. Data are fed to the "thinking machine" by as many as 10 electric typewriters at a time, or by perforated tape. The computer has a host of uses. According to the manufacturer, the machine does the work of a million-dollar computer and is worth installing in any office employing 500 people or more.



Brush Chopper Cuts Big Branches

Tree trimmers of a Florida power company feed brush into a machine that chops it up and blows it into a truck. The barrel-type cutter, with a single blade, takes a one-inch chip off butts of branches up to four inches in diameter. The brush is reduced to an easily handled silagelike mass, to be hauled away for dumping or pulp tests.



Airplane Stays on Ground to Teach Pilots How to Fly

Flying students don't wear parachutes while learning to fly in a combination automobile and airplane. Invented by an Italian, the trainer has the conventional controls of an airplane. As the car is driven along the highway, the air currents passing over the wing surfaces of the plane, attached by a swivel to the car, cause the aircraft to respond to the controls as though airborne.

☛ Birds are repelled by a substance that is sprayed on roosting places with an aerosol bomb, and is effective for over a year.





Electronic Tail Guns Kill in Fog and Dark

Protecting the Air Force's Boeing B-47E Stratojet bombers are electronically controlled tail turrets that can see and shoot down enemy interceptors in the night or fog. The turret mounts two 20-mm. cannon. In a danger area, the turret's radar is turned to "search." If the radar picks up an attacking plane a "pip" appears on the screen. When the target is centered in the cross hairs, the "electric brain" tracks it automatically, computes the firing information and fires the guns when the attacking plane comes into range. The turret was designed by General Electric especially for high-speed-jet operations.

Guided Missiles Ride Navy Jet

Four Sperry Sparrow guided missiles hang from racks beneath the wings of the Navy's twin-jet night fighter, the Douglas F3D Sky-night. These launched missiles travel at supersonic speeds and are directed by the fighter pilot as they rush toward their targets.

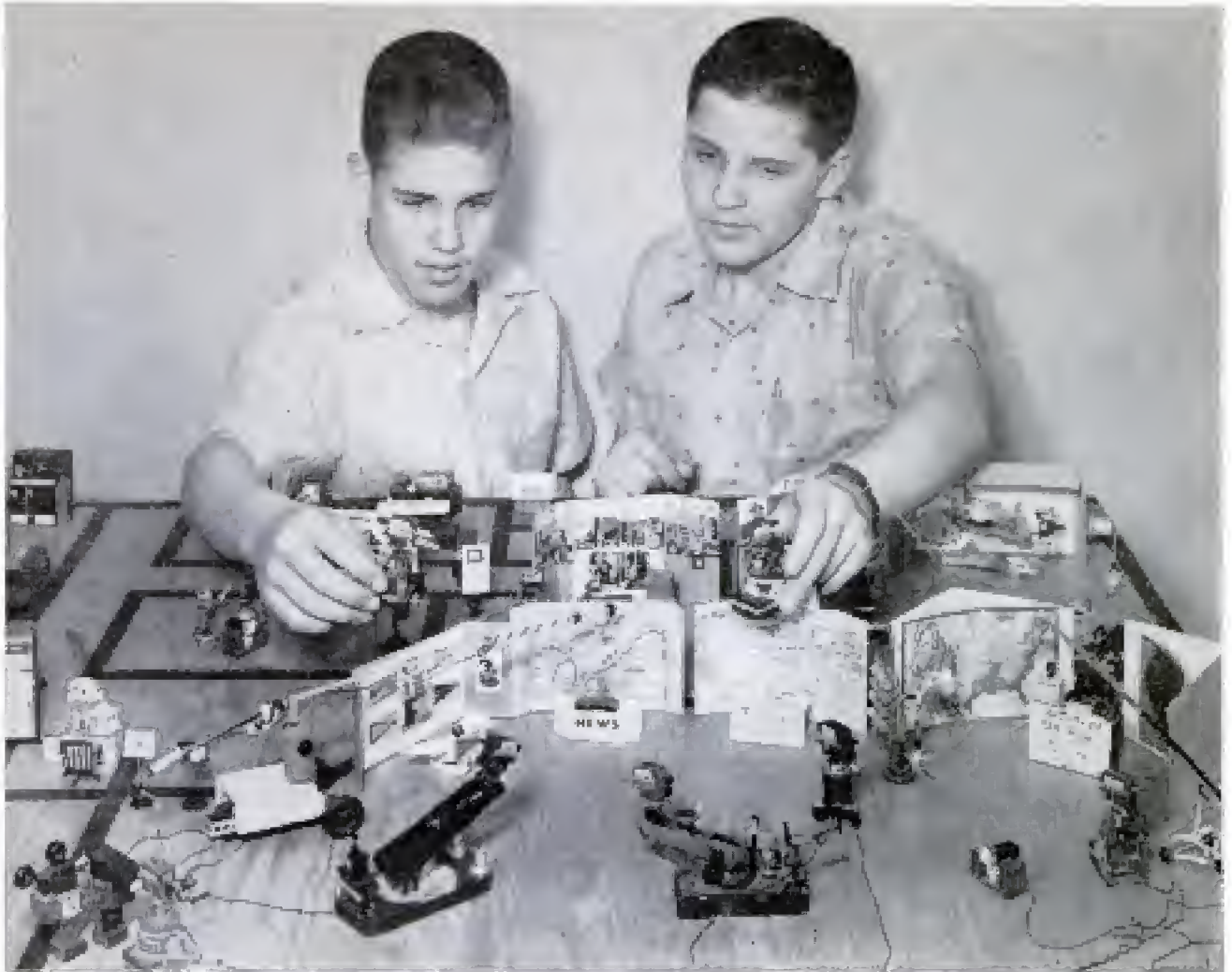


Automobile Turntable at Drive-In Bank Turns Them on a Dime

Motorists using the drive-in service of a Waterbury, Conn., bank can negotiate a sharp U-turn in the bank's narrow lot with the help of an electrically driven turntable.

As a car drives onto the turntable, it breaks an electronic beam that is directed at a photoelectric eye, and a yellow caution light flashes on. A second beam is intersected when the car is fully on the turntable, a red light warns the motorist to stop, and the table revolves to face the car in the direction of the teller's window. A third beam situated between the turntable and the teller's window stops the turntable if cars are lined up in the drive. The new feature is used once every two minutes during the average day.





Jeff Howard, 12, and Donald Wasserman, 15, pooled skill and knowledge to build this model TV-station layout

Young Technicians Build Accurate Models of Television Equipment

At an age when most youngsters simply watch TV, Donald Wasserman, 15, and Jeff Howard, 12, of New Haven, Conn., are building accurate replicas of television broadcasting equipment. Their biggest project has been a complete layout of a TV station, which they've exhibited on three television programs and at the local do-it-yourself show. They have also built a model of a transmission station, a mobile unit and a home containing a tiny receiver.

Cameras, booms, cable and other gear are made from pieces of wood, pins, matchsticks and thread. Donald, an amateur student of TV since he was eight years old, supplies most of the technical knowledge and Jeff contributes his skill in draftsmanship to sketch and build models. The Allen B. DuMont Laboratories gave the boys technical information with which to build further models and presented them with a valuable used image-orthicon tube.



Semiautomatic Shotgun With Recoil

Spring in Stock Holds to Target

Equipped with a nonrecoiling barrel and a recoil spring built within the stock, the new Model 50 Winchester shotgun is said to have very little tendency to stray from the target as shot after shot is fired. The semiautomatic shotgun has an independent

chamber that moves less than $\frac{1}{16}$ inch to actuate the breech bolt and start the cycle of unlocking, extraction, reloading and locking. An inertia rod, working against the spring in the stock, absorbs the recoil to make the gun "softer" on the shoulder.

OWNERS REPORT:



Its good points:

"I drive 500 miles a week, mostly in city, and save \$4 a week on gas. It's paying for itself."

Michigan insurance adjuster

"At 73 miles per hour, it handles as good as at 40. With it, my parking problems are gone."

Indiana animal welfare worker

Its weak points:

"Needs no-draft vents on windows. Also there should be a cover on the glove compartment."

New Jersey engineer

"Accelerator is a poor design. No foot rest."

Massachusetts insurance man

Is such a small car worth-while?

"Half the bulk of a big car is wasted. The less horsepower, the more careful a driver is."

Mississippi branch manager

"Cars are too big because we try to keep up with the Joneses. Only big families need big cars."

Massachusetts salesman

"With fuel costs going up, big cars are unwise."

New York flight engineer

"I do a lot of city driving. With my big car I was always tired, even with automatic shift. Now I shift and end up fresher and money ahead."

Michigan sales manager

METROPOLITAN IS A GOOD THING IN A SMALL PACKAGE, SAY OWNERS

By Metropolitan Owners

THE NASH METROPOLITAN is like one of the family—you love it despite its faults. And it does have faults, owners agree, but its good points are so good, its faults are unimportant.

The car's smallness is its strongest point—and its weakest one simultaneously. Owners with no previous experience in small-car driving are amazed to find it so enjoyable, yet want more rear-seat room.

"Aside from the fact that occasionally I would like passenger room in back, I have never driven a car I liked more."—Marcellus, N. Y., secretary.

"I bought this car after one ride around the block. Since then I have learned I have a real car, not just a cute plaything. I buy a new car every year, but haven't liked owning anything so much since I bought my first bicycle. I now take long rides on side roads and even wash the car myself. I haven't driven a sports car, but this car is so good it makes me believe American cars are not all they could be."—Lincoln, Neb., plant manager.

That seems to be typical. The owners are amazed that a car can be so easy to drive, comfortable, economical and yet so small.

Handling Is Best Feature

By far the best-liked feature (see percentages on page 121) is its handling and maneuverability.

CLYMER ROAD TESTS THE METROPOLITAN

By Floyd Clymer

I ABUSED this little car for 376 miles and got the surprise of my life. Performance was far better than I expected from the tiny, economical 73-cubic-inch engine (less than one third the size of a Ford or Chevrolet). The engine is a British Austin A-40 overhead-valve, 42-horsepower, 4-cylinder job.

With a rear-axle ratio of 4.6:1, the car cruises nicely at 60 to 65 miles per hour. Top speed was 78 on the speedometer.

(Continued to page 248)

"I feel superior when driving. I'm driving the car, it's not driving me."—Fair Lawn, N. J., clerk.

"Easiest car I ever owned to park or get around in. Handles as good at 70 as at 40."—Richmond, Ind., owner.

"An almost perfect performer, a pleasure to drive and a joy to own, not to mention the startling decrease in operating costs over 'standard' cars."—Dover, Mass., insurance man.

"Extremely responsive to steering on winding roads. Does not roll on turns, but will skid in wet weather and on sand."—Newtown, Conn., attorney.

Next in the owners' favor is economy.

"I save \$5 a week on gasoline alone."—Bayside, N. Y., salesman.

"My weekly expense for this car is about \$1. It will pay for itself in savings of the difference over my previous car costs."—Hammonton, N. J., technician.

"Never been so pleased with any car in my life. I drive 500 miles a week, mostly in city. This is a businessman's dream. I save \$4 a week on gas. The car is paying for itself."—Detroit, Mich., adjuster.

"I drive about 600 miles a week in city traffic and haven't had a thing done to anything. Change oil every 1500 miles. Never down a drop. Wind up with four times as much money in my pocket as with big car."—Detroit, Mich., sales manager.





Starter is operated by pull-type switch. The small glove compartment is doorless and the owners object



Brake and clutch pedals are too small, too crowded, says Clymer. That is the modified accelerator pedal

Owners object to lack of outside opening in trunk. To load it, you have to pull down the rear-seat back



Here Are Some Complaints

As mentioned above, Metropolitan owners do not hesitate to point out their cars' weaknesses. It is obvious that they believe so strongly in its good points, the weak points are not something to hide. Most frequent complaint was the awkward and uncomfortable accelerator pedal.

"Gas pedal works with very little pressure and leg gets tired on long drive. Should get away from Nash front-fender styling to give shorter turning radius."—Decatur, Ill., manager.

"Accelerator pedal is uncomfortably located even with their makeshift modification."—Bradley, Ill., electrician.

Originally, the Metropolitan had a roller-type gas pedal. Later models have a conventional organ-type slab pedal.

Water and dust leaks were second on the list of owners' complaints.

"Rubber strips around doors too narrow and don't seal. Water comes in freely in the rain."—Skokie, Ill., businessman.

"Water leaks in and the floor mats smell awful when wet. Don't like windshield wipers. Too noisy."—Boonville, N. Y., distributor.

Another frequent complaint was the lack of exterior trunk lid. To get into the trunk, you have to fold down the back of the rear jump seat.

"Trunk is inaccessible and the rear seat is of no value. Therefore if the rear seat could be pushed back and made more comfortable the car would be more desirable."—Milton, Mass., engineer.

"Don't like no outside access to trunk. After being used to garage-door trunk lids on large cars, it is unhandy to say the least. However, I seldom use this space."—Biloxi, Miss., manager.

Are Small Cars Practical?

We asked the owners of the Metropolitan to comment on their experiences with this smallest of American cars.

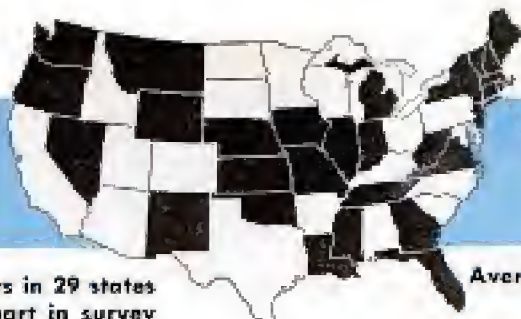
"My husband and I purchased this car for a second car, but now we would like to dispose of our large car and get another Metropolitan."—Logan, W. Va., housewife.

"I am six feet tall, weigh 260 pounds, yet I drive this car without being cramped. I use it in preference to my 1953 four-door V8 except when late or when more than one grown person besides myself is going along."—Hillsboro, N. H., lawyer.

"After driving a small car, big cars seem like arks. Too much car for the job."—Brimfield, Mass., nurse.

"We have a larger car. Do not use it as much for pleasure as we do the Metropolitan."—Littleton, Mass., secretary.

"Just returned from a 1700-mile trip.



Percentages from PM Poll of Nash Owners

Owners in 29 states
took part in survey

Average mileage reported by Metropolitan owners: 3292 miles

Average miles per gallon

Everyday driving 32 m.p.g.
Long trips 37 m.p.g.

Owners adding oil during 1000
miles 25%

Owners rate roadability

Excellent 66%
Good 34%
Poor 0%

Owners rate handling

Excellent 86%
Good 14%
Poor 0%

Owners rate structural rigidity

Excellent 51%
Good 44%
Poor 3%

Average speed driven

Normal driving 52 m.p.h.
Top speed 73.4 m.p.h.

Owners rate engine

Powerful enough 95%
Not powerful enough 5%

Owners rate car's size

Satisfactory 96%
Too small 4%

OVER-ALL RATING OF METROPOLITAN

Excellent 65%
Good 31%
Fair 3%
Poor 1%

Owners say trend to large cars

Is wise 3%
Is unwise 97%

Does small car feel safe?

Yes 100%
No 0%

Owners rate brakes

Excellent 70%
Average 28%
Poor 2%

Owners rate visibility

Excellent 87%
Average 12%
Poor 1%

Owners rate driver's seat

Comfortable 92%
Uncomfortable 8%

Owners rate passenger's seat

Comfortable 94%
Uncomfortable 6%

Only car in family?

Yes, only car 67%
No, second car 33%

Would buy another Metro?

Yes 67%
Might 30%
No 3%

Another car this small?

Might 46%
Yes 30%
No 24%

Owners rate dealer service

Excellent 40%
Good 25%
Fair 18%
Poor 17%

BEST-LIKED FEATURES

Handling, maneuverability 65%
Economy of operation 58%
Parking ease 34%
Styling 26%
Performance 16%

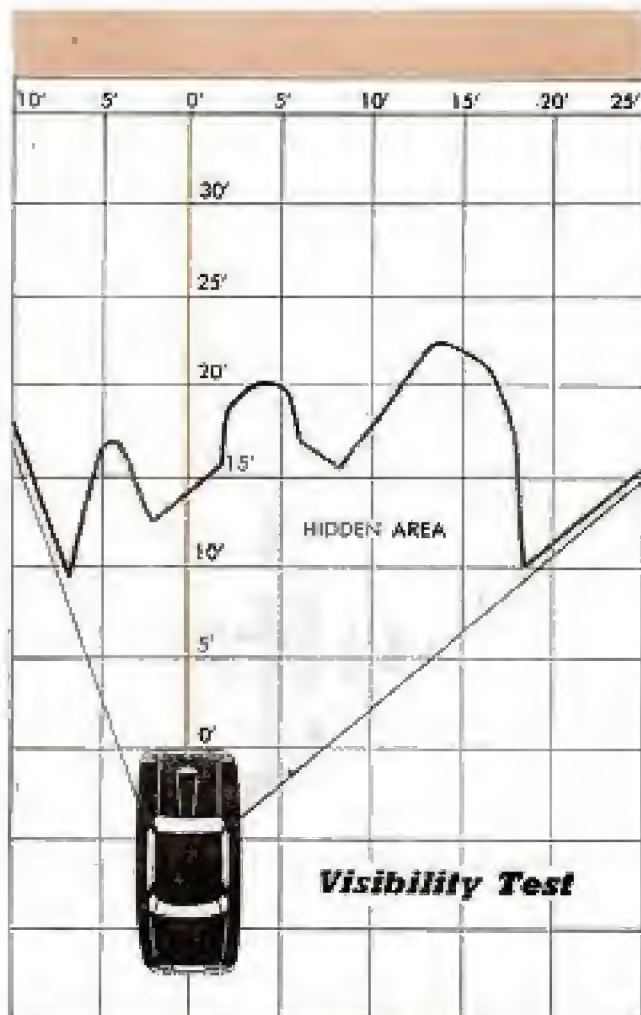
MOST-FREQUENT COMPLAINTS

Foot-throttle position 18%
Water and dust leaks 15%
Inside trunk door 13%
Dealer service 12%
Open glove compartment 10%
No no-draft vents 9%

Owners with no complaints, 15%

You can buy a Metropolitan in
either hardtop or convertible
models. It takes only a minute
for one person to put up top





Acceleration Test

NASH METROPOLITAN HARDTOP

1/4 mile from zero	74.1 seconds
1/2 mile from zero	49.8 seconds
0 to 30 miles per hour	5.9 seconds
0 to 60 miles per hour	22.2 seconds
Top speed by speedometer	76.79 miles per hour
Actual top speed about 74 miles per hour	

Economy Test

Constant-Speed Mileage

At constant 30 miles per hour	39.1 miles per gallon
At constant 50 miles per hour	25.1 miles per gallon
At constant 60 miles per hour	22.4 miles per gallon

Cross-Country Mileage

Los Angeles to Bakersfield (via Ventura; considerable traffic)	31.1 miles per gallon
Bakersfield to San Jose (via Mojave Desert)	36.6 miles per gallon
San Jose to Los Angeles (via Angeles Crest Mountain Highway)	33.8 miles per gallon

*Regular gasoline used in all tests.

Each month PM surveys owners from coast to coast to find out what they think of their cars. The results are carefully reported in this series of Owners Reports. In addition, Floyd Clymer tests the cars for performance data shown above. By these two methods, the Owners Report and the Clymer Test, we accurately report the good and bad about each car

Had plenty of baggage space and were comfortable. Two grown-ups and two children. Drove 850 miles in 17 hours, averaged 50 miles per hour and 30.7 miles on a gallon."—South Bend, Ind., salesman.

"Have a wife and baby. We make back seat into bed for baby."—Detroit, Mich., crane operator.

"Many people go too deeply in debt for cars. They buy to satisfy their ego, not their real needs. Even a teacher can afford this car."—Bernardsville, N. J., teacher.

Are Small Cars Safe?

"It gives a sense of speed when on the road which you do not have in the big car. Consequently we drive slower."—Normal, Ill., businessman.

"There would be fewer mishaps and deaths caused by reckless driving if all cars were Metropolitans."—Newburgh, N. Y., machine operator.

"I feel completely safe except when big trucks follow too close behind."—Franklin Square, N. Y., clerk.

"I notice that large cars tend to cut me off. I have to watch every one that passes so they don't cut into me too soon."—Amityville, N. Y., aircraft engineer.

"Very safe, because of fast reaction to steering."—New Orleans, La., traffic manager.

Other Best-Liked Features

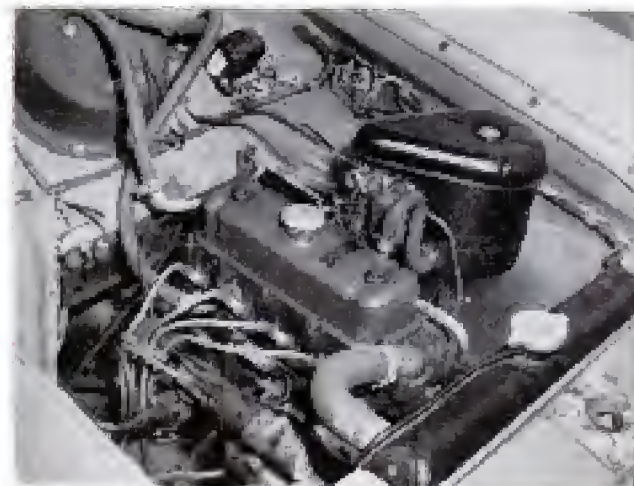
"Large part of big-city parking problems can be solved with small car."—Chicago engineer.

"I park on the streets of New York City and many times have found a parking place the ordinary car would not fit. Commuting is now as cheap as a bus, cheaper than a train, more convenient than either."—Old Tappan, N. J., bank teller.

"Uses little garage space."—Cedar Rapids, Iowa, engineer.

(Continued to page 244)

Engine is so tiny that it is hard to believe it will move the car so easily at 60 miles per hour or more



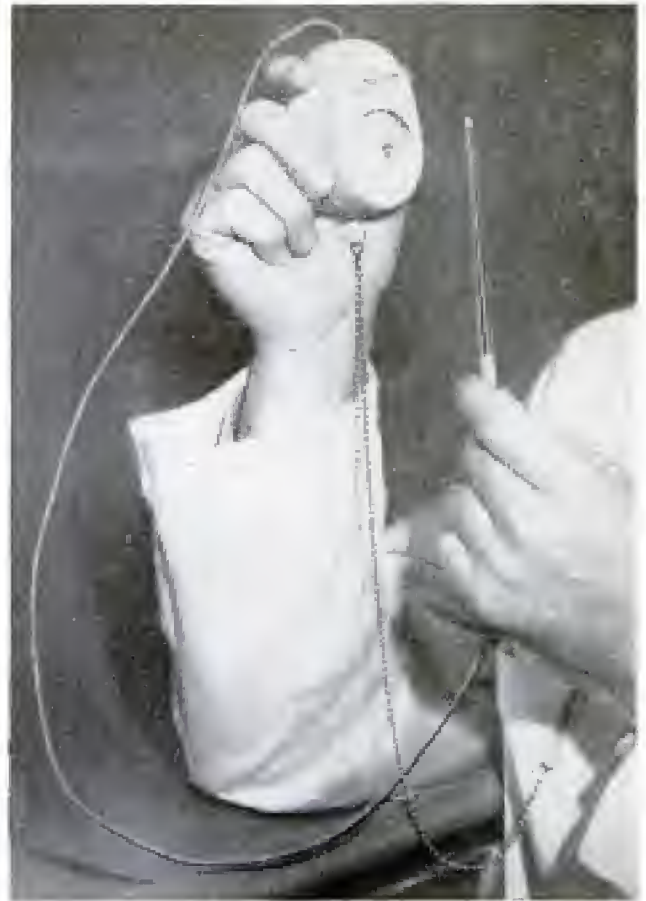
POPULAR MECHANICS

Fast Clinical Thermometer Takes Temperature in Seconds

You don't have to shake down a clinical thermometer that tells a patient's temperature in five to seven seconds. A stainless-steel probe that goes in the patient's mouth contains a tiny Carboloy thermistor that resists heat and translates this resistance into degrees on a hand-held meter. A flexible cord connects the probe with the meter, which is contained in a plastic hand-piece and is powered by a mercury-cell battery. Tests showed the new thermometer takes daily ward temperatures in a fraction of the time usually required.

Portable Icebox Carries Fish

Fresh fish are kept that way by a refrigerated container that is shipped directly to its destination. The conventional method is to transfer the fish from a refrigerated railroad car to cold storage before delivery to buyers. The insulated aluminum container, which holds 150 pounds of fish, is kept at 29 degrees for 100 hours by a mixture of sodium sulphate and water sealed in rubber plaques.



Telescoping Trailer Doubles Its Size

When it's on the road, a two-wheel cabin trailer built by A. B. Walfrid of Minneapolis is collapsed for easy traveling. The top half of the cabin, which is 47 inches high, drops down over a 42-inch-high bottom section. When it's time to stop for the night, Walfrid quickly raises the upper section with a winch. Light and air are supplied by three screened windows in the outer shell. The top rear doors swing out on both sides and, since they are wider than the lower door, permit access to the trailer even when it is collapsed. Walfrid, starting with an ordinary 44-inch by 72-inch two-wheel trailer, built a cabin of tempered hardboard supported by pine bracing. It is 6 feet, 8 inches wide, and 11 feet, 8 inches long. Cost of conversion was \$250.



British Information Service photo

Flying Suit With Air Supply Cools British Jet Pilots

Designed to keep pilots cool at very high speeds and extreme altitudes, a new British flying suit is plugged into an air supply that is distributed through vein-like tubes to about 100 parts of the body. It is worn beneath the pilot's pressure suit and other safety equipment.



Handmade Electric "Bicycle" Aids Recovery of Polio Victim

Using a specially designed electric bicycle has hastened the recovery of an Australian polio patient. The handmade machine was built by Ronald Ashcroft of Sydney for his younger brother. Built-in shoes attached to the pedals drag the patient's feet with them slowly when the power is turned on. Later he works the pedals himself.

Folding Projector Table Includes Outlets, Viewer and Switch



Easy storage is only one feature of a folding table for slide and movie projectors. Others include a built-in switch, two outlets, an illuminated viewer and a 15-foot electric cord. The viewer permits a preview of the slides before projection; in addition it casts a soft glow of light under the table. The switch turns on one outlet while turning the other off, so that it is possible to switch on the projector and simultaneously turn off room illumination. The table top tilts to the proper projecting angle. Construction is of steel.

Information not listed on articles in the Index, starting on page 12, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy of this list may be obtained simply by sending a postcard to the Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Illinois

Mechanics' Tower Reaches Up 43 Feet

MECHANICS checking B-52 Stratofortresses at Boeing Field in Seattle use a giant workstand owned by the Air Force. The stand, which is hydraulically and electrically operated, extends to a height of 43 feet. That's just five feet short of the tip of the bomber's tail.



Worlds You Can See Through



Geographer points to markings inside a transparent-plastic globe which can never be worn off by handling

DID YOU EVER WONDER what is on the other side of the world from the place where you stand? Is it ocean depths or mountains, desert or the site of some strange city? Globe makers in Philadelphia are answering these questions by making worlds that you can literally see through.

These worlds are made of transparent plastic and have diameters of six inches to three feet. They offer a "fourth dimension" where in the past man has had to be satisfied with a 3-D view.

In addition to making terrestrial globes that you can see through, the Farquhar Transparent Globe Company also makes transparent structures of the universe itself. These globes enclose spheres of the earth in such a way that the relative position of any point on earth may be determined in regard to the sun, moon or any



Globe can be turned on mount equipped with rollers or lifted out for a better look through the world. Right, holding celestial globe aloft. This globe shows stars and heavenly bodies used in navigation





Geographer's layout of a hemisphere is transferred to flat sheet of plastic by a silk-screen process



Air pressure forms softened plastic sheet into a hemisphere with electric eye controlling air valve

celestial body. This globe-within-a-globe arrangement has an outer hemisphere containing azimuth information and a small rotating "sun."

Making globes of transparent plastic is a delicate process controlled by electric eye and air pressure. The globes are made in two sections, north and south hemispheres, which are carefully joined. Markings that identify continents and oceans are inside the globe and thus do not wear away with constant handling. The student or armchair strategist can map out global campaigns with a grease pencil, or make any notes he desires, and then wipe the globe clean when he is through. The globe makers have only one concern—the political boundaries they fix so carefully within the plastic globe are probably more permanent than they are in reality.

Globe-within-a-globe (right) includes earth and celestial globe capped by outer hemisphere which contains azimuth data and "sun"



Difficult task for geographer is to compensate on flat surface for map to be "blown up" as hemisphere

Edge of hemisphere for large-size globe is neatly trimmed by machine before it joins the other half





Light Bomber Packs Heavy Wallop

Newest American version of Britain's record-breaking Canberra light jet bomber, termed the B-57B by the U. S. Air Force, has been unveiled by the Glenn L. Martin Co. Improvements in the B-57B include a tandem cockpit rather than the earlier side-by-side arrangement, fuselage speed brakes and a Martin-developed ro-

tary bomb door. Replacing clamshell bomb openings, the new door forms part of the fuselage until it is rotated 180 degrees to bring the bombs into dropping position. Armaments, other than bombs, varies, but the first B-57B mounted four napalm tanks and eight high-velocity rockets under the wings, plus eight 50-caliber machine guns.

First Military Transport Designed for Turbo Props

First U. S. military transport built around turboprop engines — jet power plants driving propellers — the new Lockheed YC-130 is designed to fly faster and higher than any other aircraft of its type. In the tradition of troop-and-cargo carriers, the big-bellied YC-130 appears ungainly on

the ground, but its four 3750-horsepower Allison T-56 engines give it high air speed. Mounted on a tandem landing gear, the giant plane has a fuselage floor no higher than a truck bed, and the high tail permits easy loading from the rear. The YC-130 carries up to 20 tons of equipment.





Steel Fence Holds Mountain in Place During Construction

Commonly used to restrain movement of men and animals, chain-link fencing imprisons a mountainside of loose rock at the site of Idaho's new Palisades Dam on the Snake River. When repeated sealing operations failed to halt the fall of rock dur-

ing intake-tunnel construction, engineers found a high-tensile-strength retaining mat in 20,000 square feet of steel fence. The mat is attached, top and bottom, to cables strung through five-inch steel anchor posts. The mat could be used in road construction.

Fluorescent Tube Lights Interior of German Automobiles

Using less electricity but providing more illumination, a small fluorescent tube is now used in Germany as an automobile dome light. It is said to illuminate the car interior like daylight, providing enough light for comfortable reading. It draws only 12 watts and has a working life of about

7500 hours. The tube is instant starting and does not flicker. A vibrator is used in the circuit. There is also a built-in socket for plugging in 110-volt electric razors. The unit can be supplied for either 6 or 12-volt systems and uses so little current it can be left on all night when parked on street.



HOW TO MAKE PART-TIME FARMING PAY



Laying cages may boost profits, but the farmer must keep accurate records

By A. B. Kennerly

IF YOU'RE DREAMING of retiring on a small farm or if you plan to go into part-time farming, you'll find that your best farm hands are the new labor-saving machines developed to take the backaches out of doing the chores.

Futhermore you will be following a definite trend. Thirty years ago one farmer in 10 was considered a part-time farmer. Today one of every four makes a part of his living from the farm, the other part coming from off-the-farm employment. But if you're planning to join the ranks of these part-time farmers, the very machines that will remove the backaches may give you plenty of headaches. When you sit down to dollar out your costs, you may find you could have bought your eggs, onions, milk and chickens

The author has had 30 years' experience in agriculture and his farm articles have appeared in national magazines for the last 10 years. Kennerly now is associated with the agricultural information center at Texas A. & M. College

Single cow with her calf may help the family budget, but a herd of 20 is a minimum if you expect a decent profit from dairying



Garden tractors take drudgery out of truck farming, but it takes a lot of vegetables to pay for equipment

cheaper at the grocer's than they cost to produce them yourself.

Take a simple enterprise like raising chickens. Poultry specialists such as those at Texas A. & M. who check costs and production on all size flocks quote two sets of figures: 25 hens or 300. What they mean is that if you want to keep a few hens strictly for your own use, keep no more than 25 hens. If you are thinking of selling eggs, don't keep less than 300 hens.

You're interested in selling chickens and eggs? Fine. It's a good business if you keep in mind some hard facts. Experimental results show that automatic feeders and waterers will save three fourths of your labor. That means if you're competing by hand with poultry growers who have this equipment you will work four times as long as they do for about the same money.

Three hundred hens will be required to justify an investment in laborsaving equipment, but 1000 or more is better. The cost of the automatic equipment for 1000 birds will be about \$600. The cost of electricity to operate the feeder may average no more than 30 cents per month.

The days when chickens could run the range and show a nice profit have passed. Greater profits come from flocks that are

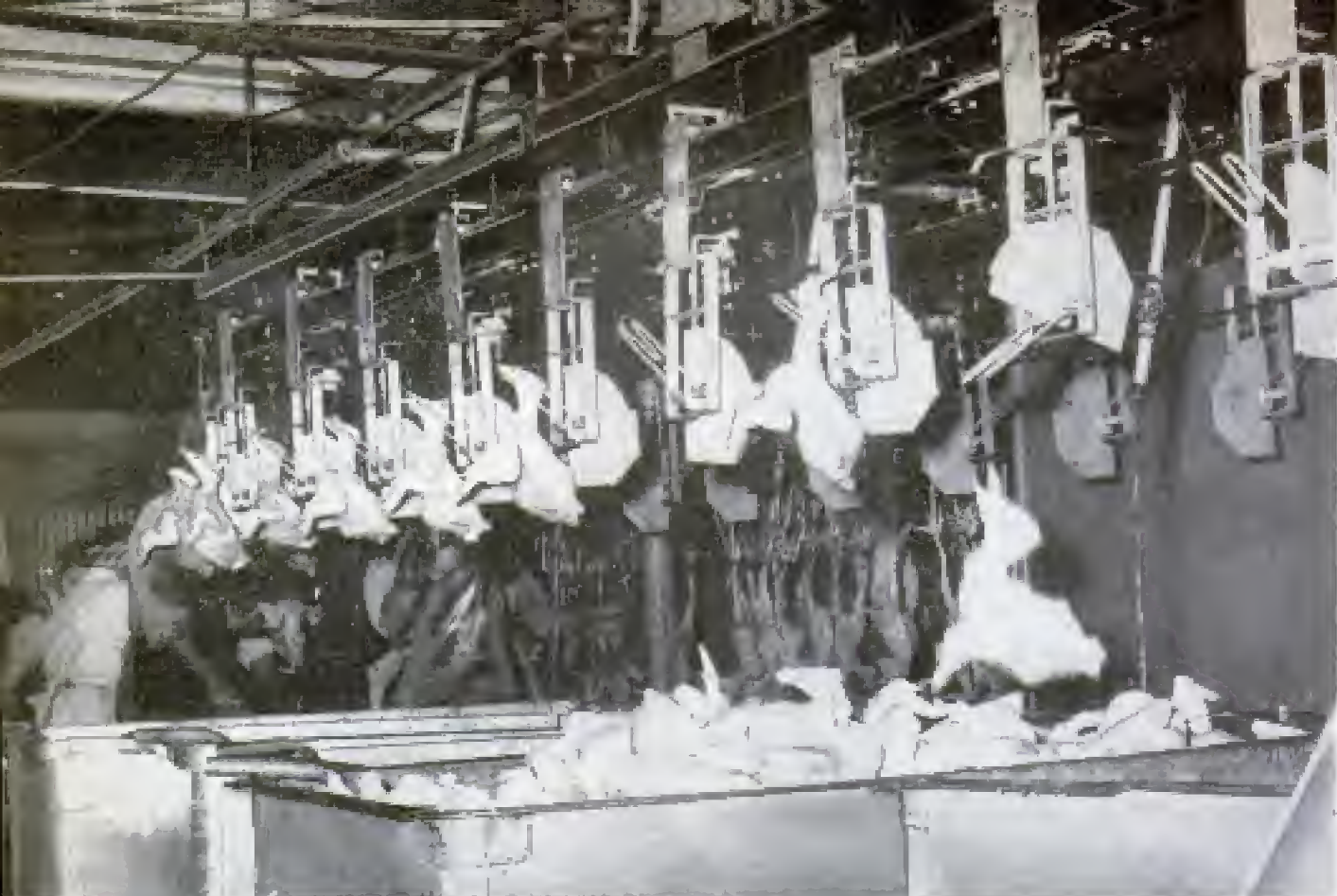
confined in laying houses, and plans for houses suitable for your climate can be obtained from your local county agent. But don't figure on overcrowding the houses. It's going to take every bit of three to four square feet for each laying hen confined in the house.

What happens if the house is overcrowded? Lower production and more stained and dirty eggs are the result.

The big trend now, especially in the southern part of the country, is toward caged hens. By this method hens are kept

Farmer helps establish brand name and regular market by prepackaging vegetables in transparent bags





Part-time farmer may have trouble competing with big broiler raisers who operate with assembly-line equipment. Below, automatic feeders save labor and reduce the part-time farmer's cost of producing eggs



Varieties of vegetables are important. Type at left may yield five times as much as one on the right



in individual cages from the time they start laying until they die or their production falls below a profitable figure.

The investment required for the laying-cage method is about \$5 a hen for the equipment and the cost of bringing the hens into production. But the profits are high. Some producers are making \$4 a hen per year from caged layers as against a dollar or two from layers on the floor. This profit has boomed the cage-laying industry and has cut the profits of poultrymen who must depend on the floor method. So competitive has the business become that in some parts of the country poultry authorities are advising back-yard and small-flock producers to get out of the business entirely. One producer in Texas is planning a poultry plant with 200,000 cages. Beginners can get by with 500 cages, but 1000 is a better figure profitwise.

Laying-cage systems, to be successful, must be run with clocklike precision. Let one operation fail or fall below par and the whole assembly line is affected. This precision involves feeding, watering, air circulation, cleaning, culling, replacement and checking up on your own technique.

The beginner should be careful in selecting a location. Examine zoning and health-department regulations. Locate the plant far enough from neighbors so they will not be bothered by the two difficulties of the caged system: flies and odors. Locate near enough to egg-marketing facilities, feed sources and shopping centers to operate and market eggs efficiently.

You can build laying cages yourself or buy them ready for installation. Hang the cages in relation to your own height so you won't have to stoop or reach up when gathering eggs and tending the birds.

Culling can make or break this system of producing eggs. To be successful, the system calls for ruthless culling. The cost of raising pullets, the price of eggs and the market price for culled birds will determine the rate at which hens should be culled. To know when to cull you must know your cost of growing a replacement pullet and the price you will receive for the culled hen. When these two figures are about the same, the rate of culling should be high. For example, each week you may remove and sell any hen that has failed to lay 10 eggs in the past 14 days. You can be more lenient if the price of eggs is high and if the cost of replacements is higher than culled hens are bringing.

Records on some laying-cage operations prove that with good management, breeding, feeding and disease control, an average of 240 eggs per cage per year can be maintained by culling about eight percent each month.

Accurate records can be kept with the cage system since eggs are gathered from individual hens. The simplest systems of keeping records include washers on a wire,

clothespins on cage wires, or pegs in holes that are used to record a 7 to 14-day laying period. More complete records can be kept with an individual card for each hen recording the date she was hatched, breeding information, date she started laying, number of broken and soft-shell eggs and any other needed information.

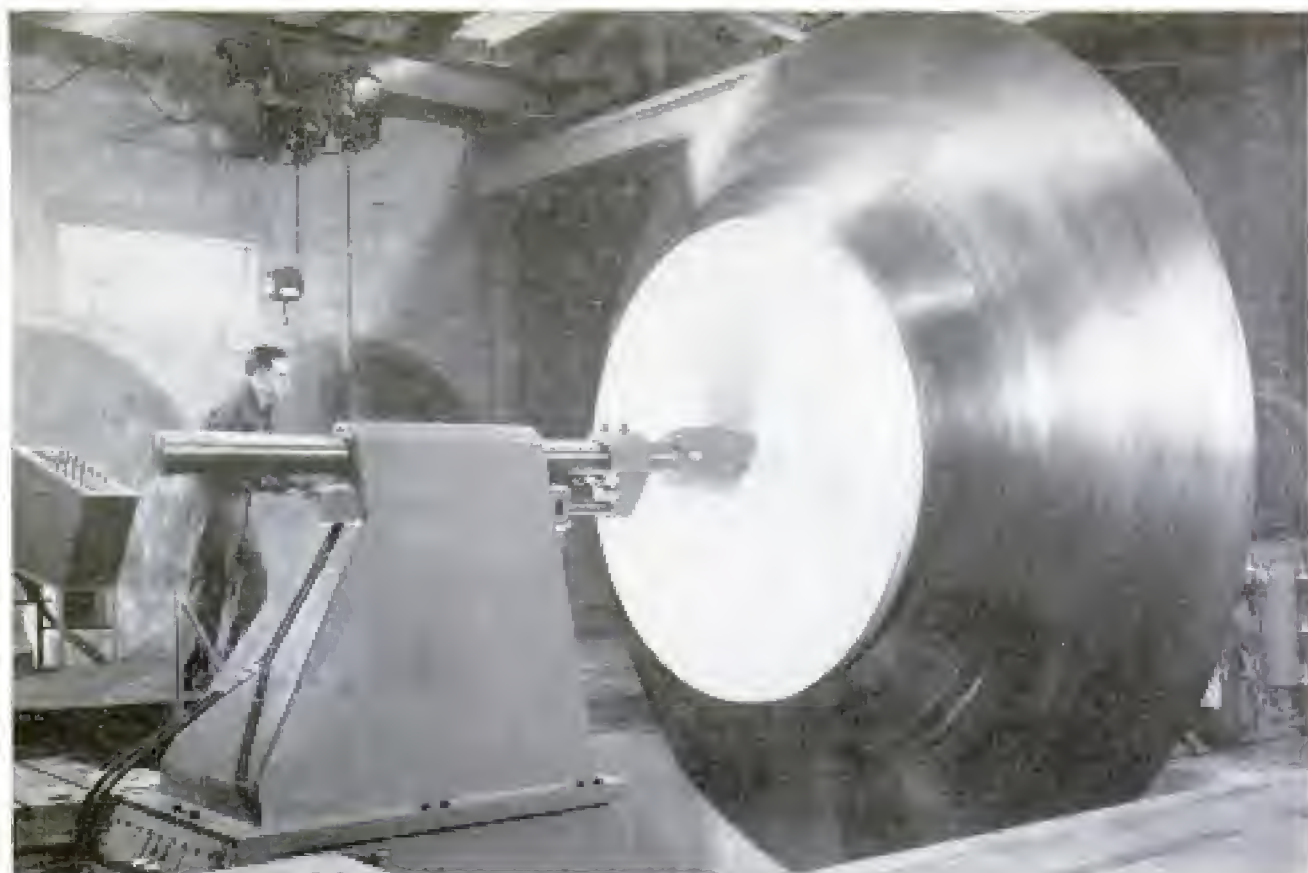
If you're figuring on broilers, you will need to think in terms of at least 3000 birds. Some houses run to 6000 birds and some operators take care of several houses. An authority at Texas A. & M. says, "If extra help is available during the first week when the very young chicks must be fed and watered by hand, one man can easily attend to 40,000 to 60,000 broilers." This requires automatic watering and feeding equipment.

If you're near a good retail outlet, battery brooding may be profitable, although it is not practiced extensively. Batteries usually are placed in rooms supplied with extra heat in the fall and winter. With this system, broilers go through three stages of production in different buildings or rooms. The first stage is the starting battery where all chicks of the same age are brooded until they are three weeks old. For the growing stage, from three to six weeks, they are put in larger batteries in

(Continued to page 228)

Automatic milkers and a well-planned layout may enable a family to milk from 20 to 30 cows without hired help





Giant Lathe of 180-Inch Diameter Fills Large Room

So big that no commercial lathe builder would tackle the job of building it, a giant 180-inch-diameter swing metal-spinning lathe fills a huge room by itself. Designed to meet the demand for larger spun shapes in atomic-energy plants and industrial air-conditioning equipment, the lathe is

powered by a 50-horsepower drive system. Spinning tools are hydraulically actuated and pressures needed for hot-spinning can be built up to a point never before reached. One example of the lathe's capacity is the spinning of a 14-foot dome for an air-conditioning installation.



Light-Metal Shakes Save Rebuilding Time

Resembling wooden shakes, insulated aluminum shingles can be applied to exterior walls in one third the time required for ordinary shingling

Aluminum Putty

Aluminum in putty form now makes all sorts of handiwork possible. Applied with a spatula or brush, it bonds to practically any surface and dries metal-hard in several hours. No special tools, heat or flame are necessary and the material can be filed, sanded, burnished, drilled or tapped. The putty can be used to bond aluminum to aluminum, to give hardware an antique or otherwise unusual appearance, to create a metal inlay in leather or wood, or metalize baby shoes. You can also make your own "leaded" glass windows with it as well as auto, shop and boat repairs.

Seagoing Train Rides Ferry

Passengers on a new German train which shuttles between Copenhagen and Hamburg get a boat ride as well as a train ride. The three-car diesel train rolls right onto a ferry, which then carries it across the Baltic Sea. The train has seats for 224 passengers and makes the trip between the two cities in about seven hours. The boat ride shortens the run considerably.



Desk-Size Electric Press Prints 1000 Tags or Labels Per Hour

Up to 1000 cards, tags or labels can be printed per hour with a desk-size electric press suited for many jobs. A companion to the printer is a case which holds 42 sep-

arate characters in indexed rows. A wide variety of type styles and sizes is available. Trademarks can also be used. Type is picked out of the case with a type fork and slipped into a grooved printing plate which is inserted in the press. The press prints with the aid of a ribbon, like a typewriter. Eleven lines of copy can be printed at once. The material to be printed is fed into the press one piece at a time. The piece itself is the trigger which causes the press to print automatically as it is placed in the jaws.



Battery-Powered Clock Comes in Kit

Electric clocks powered by batteries may be placed anywhere or hung on any wall without the usual trailing wires. They can be made from kits now available. The kit consists of a 2½-inch-diameter clock movement, a pair of clock hands and a set of hour markers. The only additional material required is a slab of hardwood or other material that serves as the clock face and a 4½-volt dry cell. Because current is used only intermittently, one cell runs the clock for approximately a year. The clock movement has three jewels and weighs less than eight ounces. The same kit may be used as a replacement for an unsatisfactory automobile clock.



Completed battery-powered clock is in the background, with the kit units in the left foreground. Clock movement and battery are shown at the right assembled as an auto-clock replacement



Four 50-foot lengths of piling made of prestressed concrete are shipped by truck, like other materials, to building site

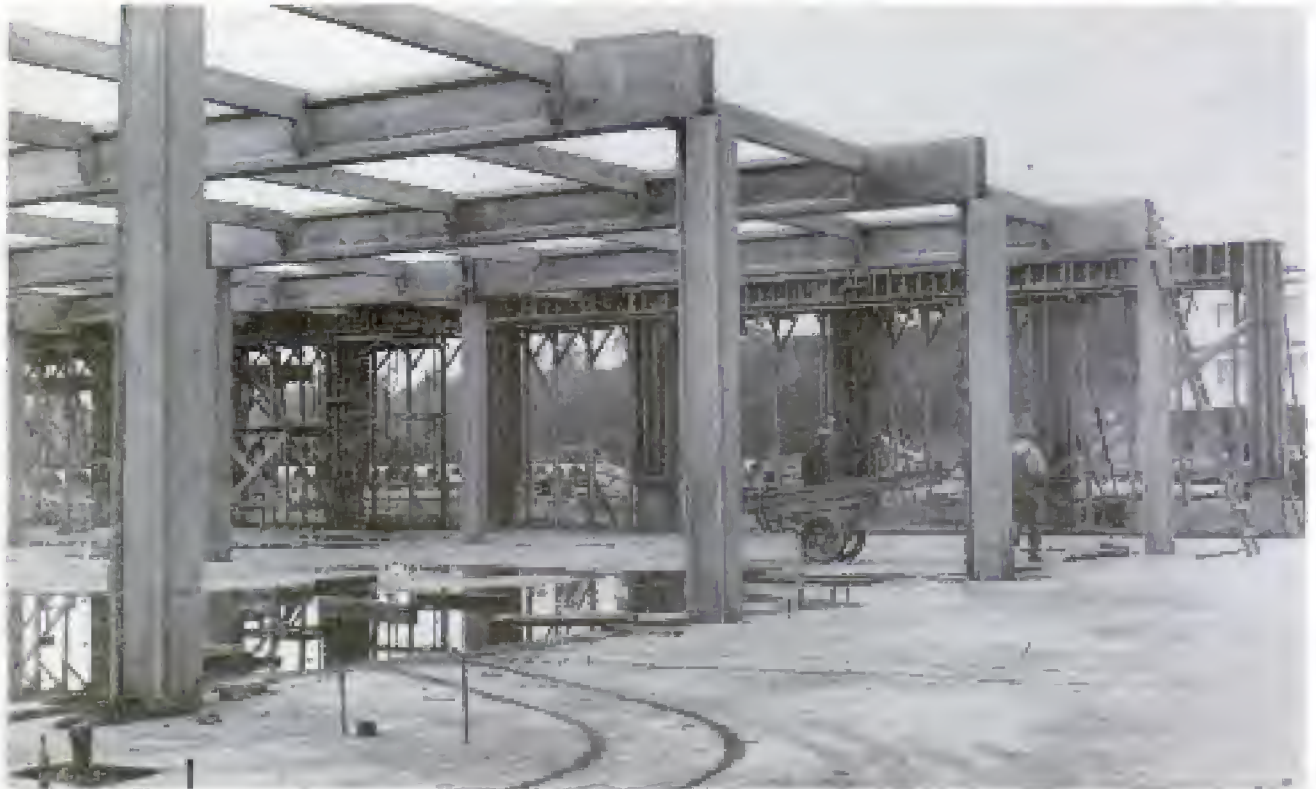
ONE OF THE NEWEST construction techniques is the use of prestressed concrete, sometimes called "rubber concrete" or "concrete with muscles." Now two ingenious brothers have succeeded in prefabricating this remarkable material into girders, beams, pilings and planks. They make these items in specified types and sizes, then ship them by truck or rail to the job site. The result is that "muscular concrete" now is ordered and handled just like steel or wood construction members.

Tom and Arthur Anderson of Tacoma, Wash., figured that prestressed concrete could be prefabricated for the builder the same as his other materials. Before setting up their plant they made an inspection trip to Europe where prestressed concrete has been in production for some time. They were particularly impressed with certain production techniques in Sweden. Back home, they devoted endless hours to planning, engineering, inventing and testing.

The "muscles" of prestressed

PRESTRESSED CONCRETE FROM THE FACTORY

Concrete girders for this building were delivered 24 hours after dry-mix concrete had been placed in forms



concrete are provided by wires which are stretched through the form. When the concrete hardens, the wires tend to contract, providing a built-in tension that makes the concrete far stronger than ordinary poured concrete.

In a test made last year on an Anderson 40-foot concrete girder, a load of about 40 tons, placed near the middle, caused the girder to deflect four inches. When the load was removed, the girder returned like a giant spring to its original position. With an ordinary section of concrete of this size, conventionally strengthened with reinforcing rods, the deformation would be devastating—about the same as a 40-ton Army tank crushing your sidewalk.

The problem of the two brothers was to work out a system that would produce the strongest possible girders and other construction members. Here's the method they finally decided to use:

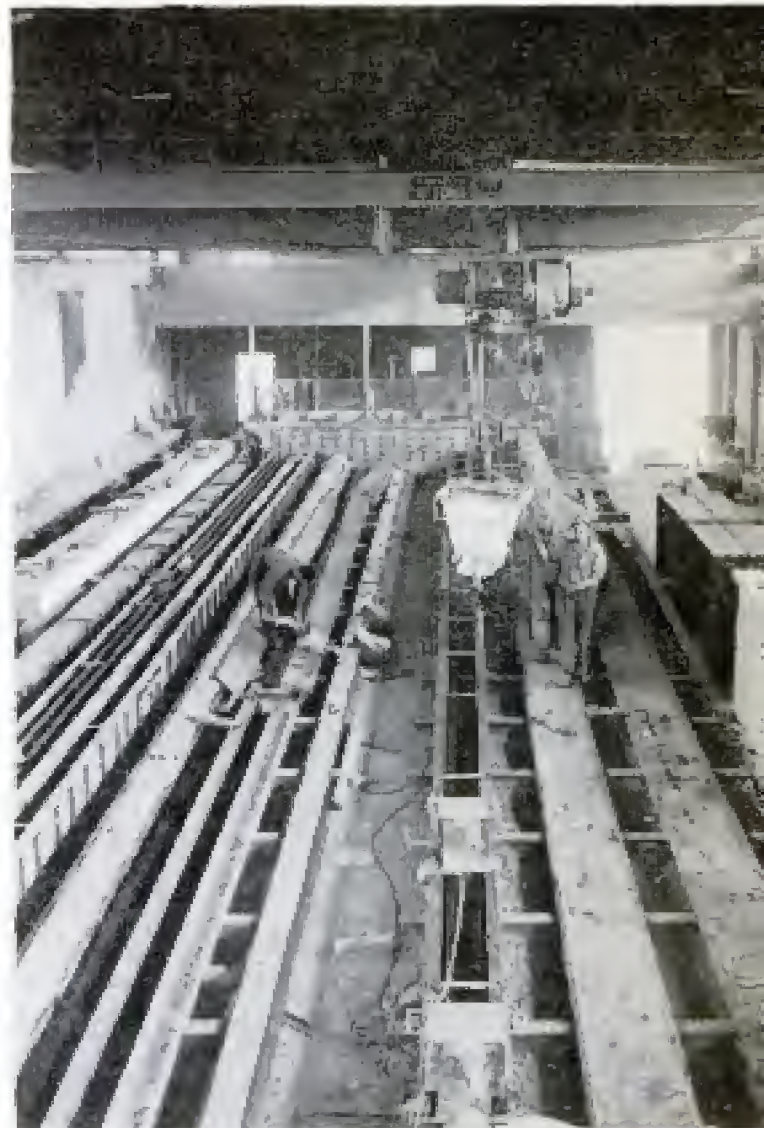
Custom-made, stranded wires $\frac{5}{16}$ inch in diameter are anchored at the end of a steel form in which the girder will be poured. The number of wires used in the form depends upon the size of the girder and the load it must bear. Then, with special hydraulic jacks, the wires are put under extreme tension. The pulling force is so great that the length of the wire is increased 10 inches.

An exceptionally dry-mix concrete is placed in the forms and vibrated with electric "shakers" clamped to the forms. Thus agitated, the dry-mix concrete flows, as Tom Anderson says, "like melted butter in a hot skillet."

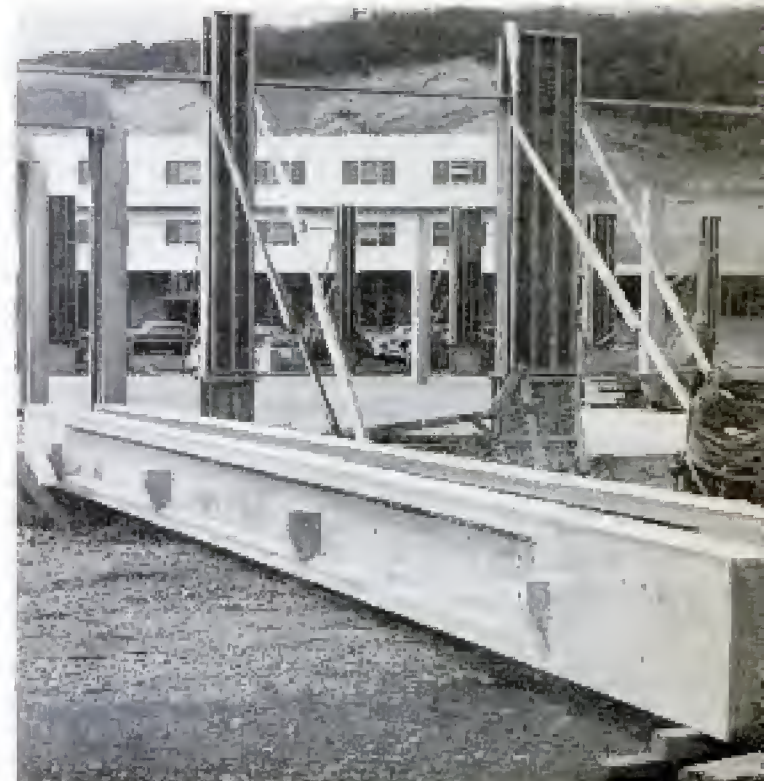
When the concrete has cured a sufficient time, the hydraulic jacks are backed off. The tension on the wires is maintained by the bonding action between the concrete and the wires. The result is that the girder has a built-in compression.

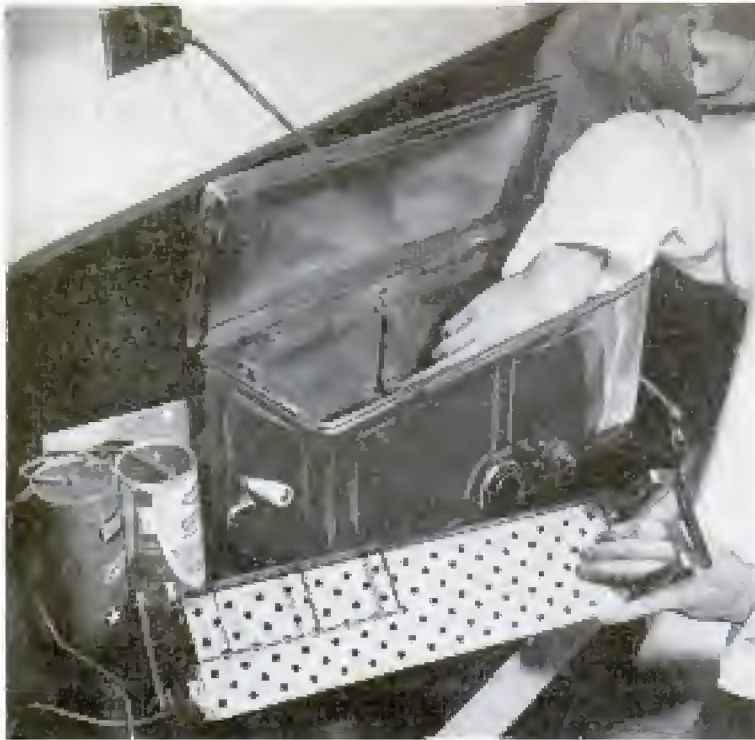
The Anderson brothers not only had to whip the problem of producing the prestressed beams and girders, but also of convincing contractors that they were stronger than many conventional building materials. Most building codes make no mention of prestressed concrete, and certainly nothing about the prefabricated stuff.

Gradually, though, the brothers have overcome the doubts of construction engineers as well as sidewalk superintendents. They recently worked out building-code requirements for prestressed concrete which were accepted with minor revisions by the City of Tacoma. As a result, the Andersons' factory-made girders and beams are being used on building projects throughout the city, and the brothers have firmly established prefabricated, prestressed concrete as a modern building material. ★ ★ ★



Concrete from traveling bucket is dropped into the form. Wires in form have already been placed under extreme tension. Below, girders ready for erection





Electrical Current Protects Instruments

Delicate surgical instruments can now be sterilized in boiling water without blunting their sharp edges. In a new sterilizer, an instrument is attached to the negative terminal of a battery, another piece of metal to the positive terminal. Electrical current passing through the water from the instrument to the other metal prevents electrochemical corrosion of the instrument. Neither boiling the instruments nor immersing them in a chemical solution (which does not completely destroy bacteria) has been satisfactory in the past.

\$100,000 Radio Telescope Aids Astronomy Students

It took \$100,000 to build the radio telescope with which Edward Lilley and David Heeschel worked to secure doctorates in radio astronomy at Harvard. This will be the first time that such degrees have been awarded anywhere in the world. The wire-mesh parabolic antenna of their radio telescope is 24 feet in diameter and is mounted on a small building. The instrument traps radio waves originating in distant constellations.



Giant Bow Saws Cut African Tree

Workmen in Hamburg, Germany, used huge chain bow saws to cut apart the trunk of a giant African pear tree. The trunk, which weighed 60 tons and was 7½ feet in diameter, furnished enough lumber for 6000 cabinets.

☛ Pigeon races are so popular in Britain that in one region British Railways carries an estimated 25,000,000 homing pigeons to and from races each year.



Agile Wheelchair Steps Up and Over Sidewalk Curbing

Chair-ridden patients appear to lift themselves over curbs by pulling on their own bootstraps when using a wheelchair developed at New York University. Nine inches longer than a conventional chair, the curb-climbing model has two sets of steel legs that lift the chair up when two hand cranks are turned. The patient simply rides up to the curb, rotates the operating handles three times, pushing down two front legs. By the end of the third turn of

the handles the front wheels are safely up on the curb. He then propels the chair forward slightly until the rear wheels touch the curb. Rotating the handles in the opposite direction extends two rear legs, raising the rear wheels onto the sidewalk. It takes no greater effort to accomplish the lift than it does to propel a wheelchair along a level stretch of sidewalk. The complete operation of climbing a curb takes less than a minute.

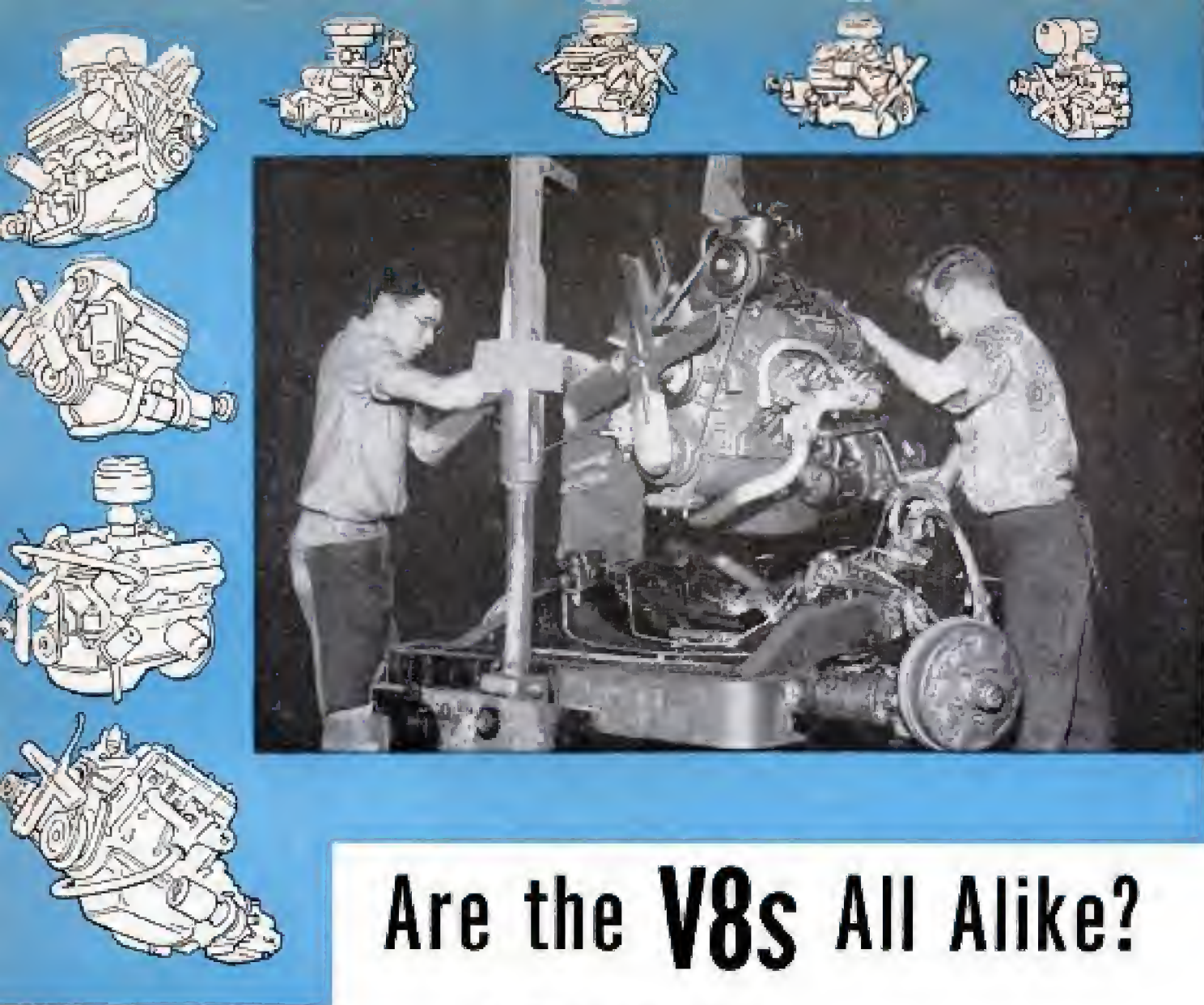
Flashlight Batteries Power Automatic Spit

Two flashlight batteries power a portable spit that slowly rotates a chicken or other meat over the coals of a campfire. The unit also may be attached to an ordinary back-yard barbecue brazier. Two flashlight cells operate the unit for 20 to 30 hours.

Double-Action Hydraulic Brakes

Developing twice the braking pressure of conventional systems, a two-stage master cylinder is said to provide "power" brakes without air or vacuum assist. The basis of the system is a master cylinder that switches automatically from low pressure to high pressure, doubling the braking power. The system has been used for some time on trucks and is now being made for passenger cars. Easy to install, it costs less than usual power-assist brakes.





Are the V8s All Alike?

By Roger Huntington

Member, Society of Automotive Engineers

CAN THE DESIGN of a machine ever become so highly developed—such an exact science — that there is only one "right" way to do it?

John Q. Public could very easily get that idea about the design of automobile engines. With a couple of exceptions, every basically new engine to come out of the American auto industry since World War II has been a V8 with push-rod-operated overhead valves, stroke shorter than the bore and five main bearings.

But are these new V8 engines really alike? The eye of the engineer detects some interesting and significant differences not apparent to the layman.

Combustion Chambers

Engineers never have been able to agree on just how we should burn the gasoline in an internal-combustion engine. They all know that for maximum smoothness and resistance to "ping" the rise in pressure in the cylinder during combustion should be gradual and peak pressure should not be too high. But this can also cause a drop in maximum horsepower and torque. Com-

bustion therefore must be a compromise.

There are three schools of thought in the industry today: Cadillac, Oldsmobile, Studebaker and all the Ford divisions use a compact wedge-shaped combustion chamber, with valves in the top at a slight angle and the spark plug set in one corner. This layout gives a lot of turbulence, or swirling motion in the gas mixture to promote smooth, rapid combustion. Yet the chamber walls are not wide open around the plug, so peak pressure is moderate.

Chrysler engineering—and this includes DeSoto and Dodge—doesn't see it this way. Chrysler soft-pedals combustion control and gambles everything on brute horsepower. They place the valves at a steep angle on opposite sides of a "hemispherical" combustion chamber with the spark plug at the top of the dome. They realize that this shape of chamber doesn't give a lot of turbulence, so it can't handle as much compression without knocking as the small wedge-type and it might even be a bit rougher. But the beauty of it is that you can crowd huge valves into the dome area,

even bigger than they're using now! This means freer "breathing" and gobs of power. Because of this extra valve area and improved porting layout, the other V8s will never be able to touch the Chrysler products on horsepower per cubic inch of piston displacement. Chrysler thinks performance is the key to the future.

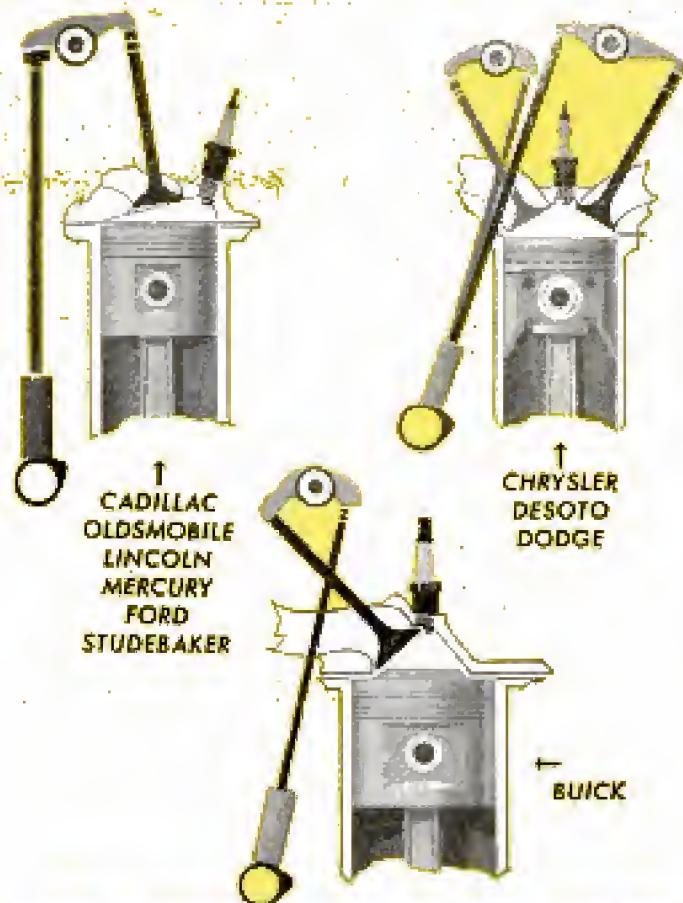
Buick is in a category by itself. They use a "pentroof" shape of combustion chamber (an inverted V) with the valves on one side and the plug in the top. This doesn't leave room for very big valves, but Buick engineers figure by building up the top of the piston in the proper shape they can get a compact chamber that will give very smooth combustion and good knock resistance. They proved the courage of their convictions by using a compression ratio of 8.5:1! Results have been so-so. Combustion is quite smooth, but knock resistance is only fair and moderate valve area limits the power potential of the design.

Anyway, you can see that our new V8 engines are far from being alike.

Manifolding

There are interesting differences in the layout of manifold tubes and ports that deliver mixture in and out of the cylinders on the new V8s.

Consider the intake side. The problem here is to get equal mixtures of fuel and air to each cylinder with a minimum of breathing restriction. It's a headache, believe me. You can't possibly get all the liquid gasoline to vaporize in the manifold and what doesn't has a way of ducking into the wrong cylinder, making some run rich and others lean. Some engineers think that by directing the mixture from the carburetor up against a more or less dead end in the manifold passages before it branches off to the various cylinders, the resulting turbulence will mix the fuel and air and improve the distribution. All the Chrysler divisions, Ford divisions, and Buick go for this idea. Cadillac, Oldsmobile and Studebaker see it just the opposite! They don't think the "buffer end" does a lot for distribution, and certainly short, smooth passages from carburetor

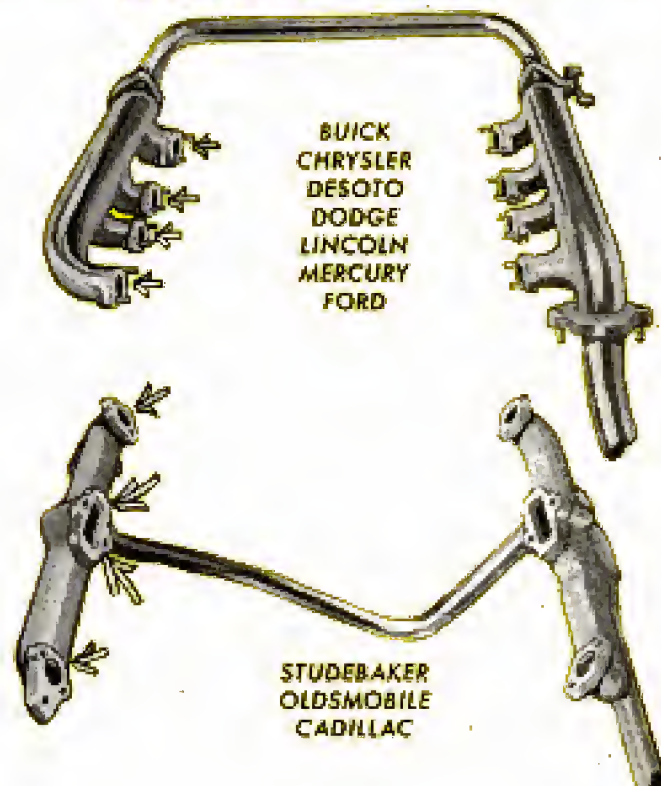


COMBUSTION CHAMBERS AND VALVES

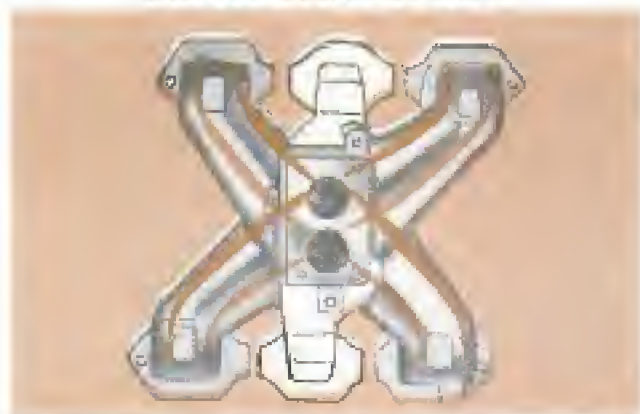
Above are the three types of combustion-chamber design. They are (1) the wedge-shaped (like Cadillac), (2) the hemispheric (like Chrysler) and (3) the inverted V (like Buick). Note Chrysler has two rocker-arm shafts

Below are the two basic exhaust-manifold designs. One has four individual parts on each bank (like Buick). The other combines the two center ports (Studebaker)

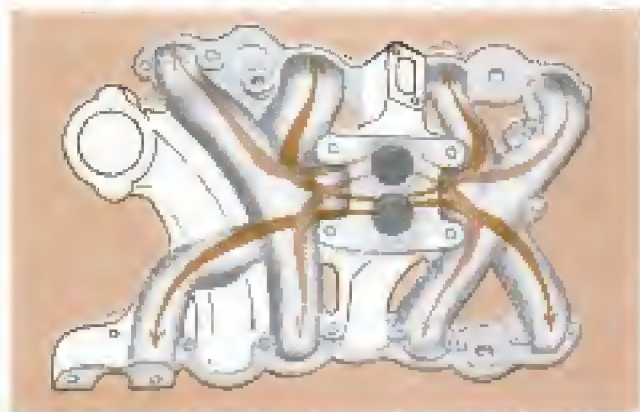
EXHAUST MANIFOLDING



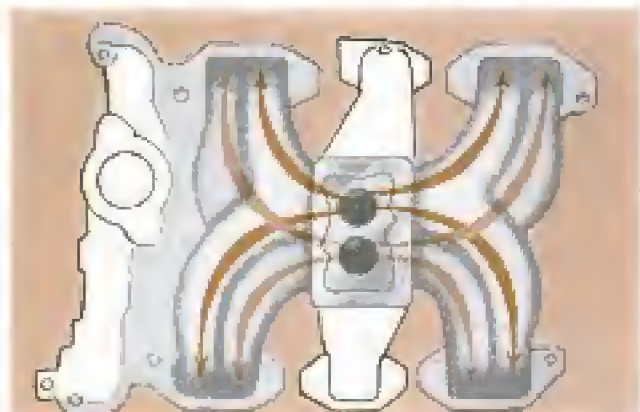
INTAKE MANIFOLDING



Studebaker's intake manifold is a straight-line X. Passages from carburetor to ports are very direct

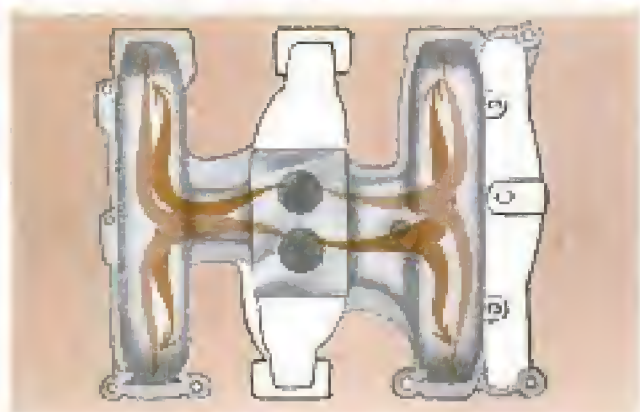


Chrysler divisions and Buick use a dead-end type of passage, creating turbulence that mixes fuel and air



Cadillac and Oldsmobile go in for smooth curves in their manifolding. They see no need for turbulence

All Ford Motor manifolds have an over-and-under design to make passages the same length for even flow



to cylinder-head ports should be better from the breathing angle. Studebaker uses straight lines from carburetor to ports, with a general X-shape manifold. Oldsmobile and Cadillac use smooth curves.

Exhaust porting is no cut-and-dried deal, either. Cadillac, Oldsmobile and Studebaker have a single "Siamese" port for the two center cylinders on each bank. None of the others would be caught dead with a Siamese port! Also, Cadillac and some Chrysler models have separate exhaust-outlet lines for each bank . . . a la hot rods.

Crankshafts

All V8 crankshafts probably look alike to you. Actually there's an interesting behind-the-scenes difference here. All manufacturers except Ford (with Mercury and Lincoln) forge their crankshafts. Because of certain mass-production economies much too complicated to go into here, it is not practical to provide counterweights for the center main bearing of a five-bearing V8 shaft when you forge it. Ford casts its crankshafts. There are no limitations here and Ford, Mercury and Lincoln shafts are fully counterbalanced at the center main, which makes possible somewhat closer control of over-all engine balance.

Valve Trains

Detroit is in trouble with excessive valve-train wear on some of the new V8s. Terrific rubbing and impact forces between the camshaft lobe and valve-lifter face, necessary because of ever-higher speeds and higher valve lift, are chewing up parts like taffy. One dealer said he was replacing lifters regularly at anywhere from 1000 to 7500 miles on his new models; another found some cam lobes worn away at 95 miles!

Engineers are knocking themselves out to find the answer. All makers except Buick cast their camshafts; Buick forges theirs. Many "soup up" specialists around the country have found that the stock cast shafts absolutely will not stand up under high valve loadings and always replace them with forged billet cams on hot engines. There may be something here. Or maybe the material and surface treatment of the lifters are the key. Some makers use steel, some cast iron or chilled iron. (And, as far as that goes, some engineers think that oil additives may be a factor.)

The question of whether to use more costly hydraulic lifters to take up valve-train clearances and quiet valve action is unsettled. Chrysler, DeSoto, Dodge, Cadillac, Oldsmobile, Lincoln and Buick think hydraulic lifters worth the cost. Others claim you can't tell if an engine has solid or hydraulic lifters after it's partly warmed

(Continued to page 252)



Swedish Torpedo Boat Built to Resist Effects of Atom Bomb

First of its kind is the Swedish Navy's *Plejad* motor torpedo boat, said to be the only ship ever designed to resist the effects

of an atomic bomb. Five such vessels are planned. The *Plejad* has a displacement of 150 tons and a top speed of about 40 knots.



Mechanical Rain Guard Closes Windows Automatically

In Florida, where sudden squalls are frequent during the rainy season, one company makes an automatic system to close your windows when it rains. A unit containing a sensitive moisture grid is installed on each side of the house. When rain touches the grid, a relay closes and starts small motors which close the windows on one side of the house. When the grid dries, it starts the motors again, which open the jalousie windows. All windows can be operated from a master switch.

Moisture grid, left, below window starts the mechanism. Below, master switch also controls windows

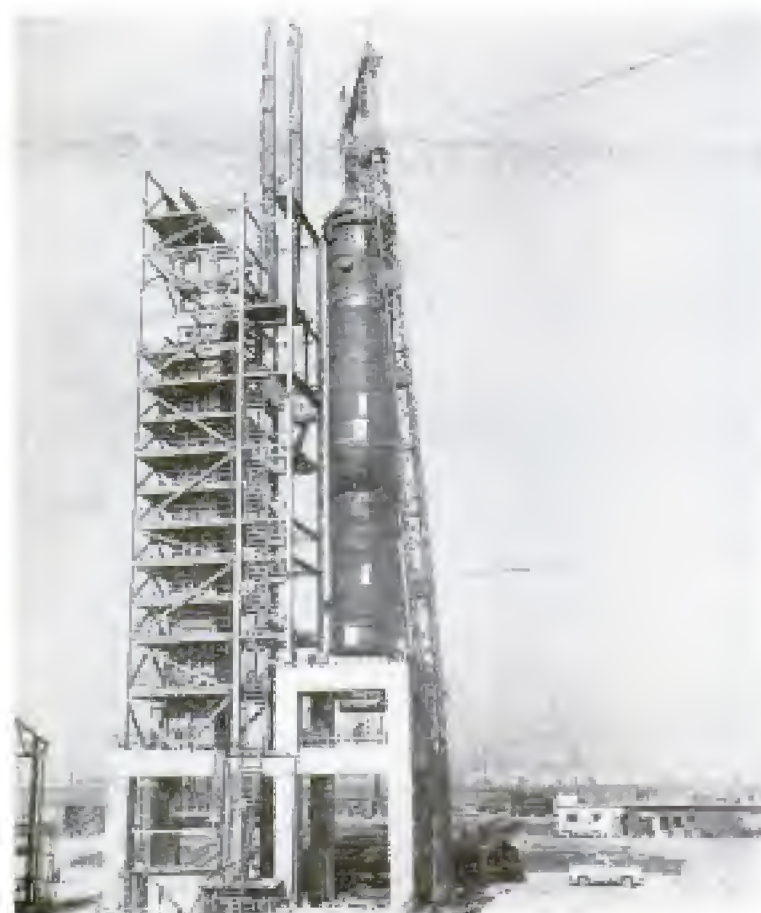




Rugged Light Plane Takes to the Air After 30-Yard Run

You can fly as slow as 27 miles per hour or take to the air after a 30-yard run with a new plane designed for the amateur pilot. It won't stall or spin, according to the manufacturer, and is equipped with cross-wind landing gear for safety. It can land into a 10-mile-per-hour wind at a ground speed of 17 miles per hour and by safe braking can come to a dead stop in less than 50 feet. Because the plane requires

only a short landing strip, it can replace helicopters for certain uses. At the same time, it has the cruising speed, useful load and range of the conventional light plane. The front wheels are placed well forward to prevent "nosing over" upon landing. Sharp banks and turns are possible with safety. Simplified controls make it easy to operate. The "Courier" is made by Helio Aircraft.



89-Foot Reactor Tower Erected With Tall Booms

Riggers used 175-foot booms to drop an 89-foot reactor tower onto its 44-foot base at a Torrance, Calif., refinery. The 190-ton steel tube, 13½ feet in diameter, settled into place without bending a single one of the bolts encircling its base flange. The tower is a key section of a catalytic reformer unit that will produce about 15,000 barrels per day of high-quality gasoline-blending stock for the General Petroleum Corporation.

Radiation Slows Fungus

Atomic radiation increases the resistance of plants to a fungus disease, recent experiments show. Small dosages of radiation applied to plants made them 50 percent more resistant to Fusarium wilt, a common plant disease in New England. Radiation strong enough to kill the fungus completely stunted the growth of the plants.

Truck-Powered Side-Wheeler Transports Supplies Across River

Men of the United States Coast Guard stationed on the Philippine island of Palawan ferry their supply truck across a near-by jungle river on a unique side-wheeler. The rear wheels of the truck rest on rollers mounted in the gasoline-drum craft. On each end of one of the rollers is a paddle wheel with shallow, lightweight blades which revolves as the wheels spin the rollers.



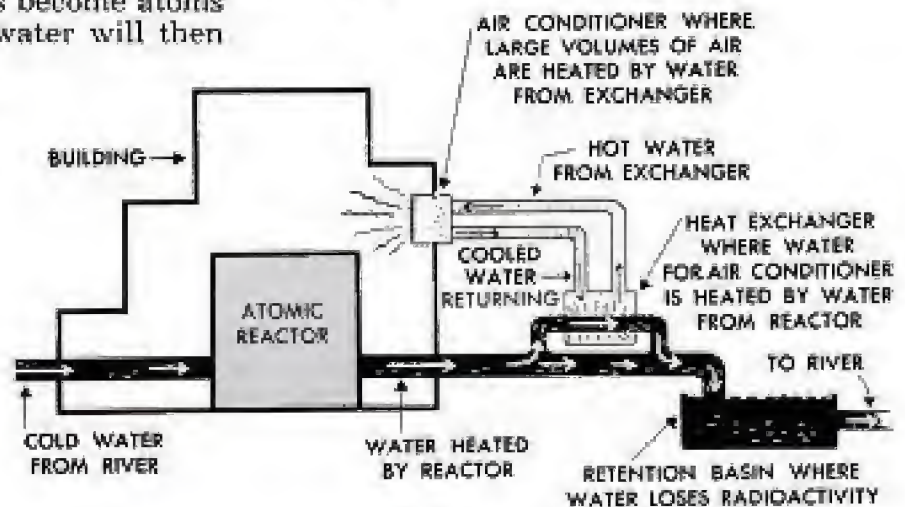
Three-Wheel Tractor

Sharp, quick turns are possible with a three-wheeled garden tractor that has rear steering controlled by handle bars. A two-horsepower engine coupled with the single front-drive wheel provides power for a reverse speed or a three-mile-per-hour forward speed. A drawbar midway between front and rear of the tractor handles cultivating and light disking equipment. Maintenance equipment attaches to a rear drawbar, while the 30-inch reel mower, sickle bar, snowplow, sprayer and compressor are front-mounted. The compact, rugged unit has ample crop clearance.

Fuel Costs Slashed by Atomic Heater in Plutonium-Plant Buildings

Atomic reactor heat will be used in new buildings at the Hanford plutonium plant near Richland, Wash. Water from the Columbia River will be pumped through a reactor to absorb the tremendous heat produced when uranium atoms become atoms of plutonium. Part of the water will then go through a heat exchanger, where it will heat water for an air-conditioner-type heating unit for the buildings. Air warmed by the water will then be conducted into the buildings. Water from the reactor can't be piped directly into the air conditioner because dissolved minerals become slightly radioactive in the reactor and a leak in the coils would allow this

water to get into the air going into the buildings. The heating system, designed by engineers for General Electric, is expected to make possible an estimated yearly fuel saving of \$59,000.





The metal is heated in this furnace, at White Oak Naval Ordnance Laboratory where Thermenol was developed

Tough Alloy for Hot Jobs

From a Naval Laboratory comes the new recipe for Thermenol—a metal combination that may be a substitute for stainless steel in jet planes

STAINLESS STEEL now has a competitor that can do many of the same jobs but is low in cost and formed of easy-to-get materials.

Known as Thermenol, it is an alloy of iron, aluminum and vanadium or molybdenum. It may be a substitute for some of the high-temperature alloys now used in jet engines. Experts describe it as a "natural" for such things as airplane, truck and automobile exhaust systems where hot, corrosive gases must be handled.

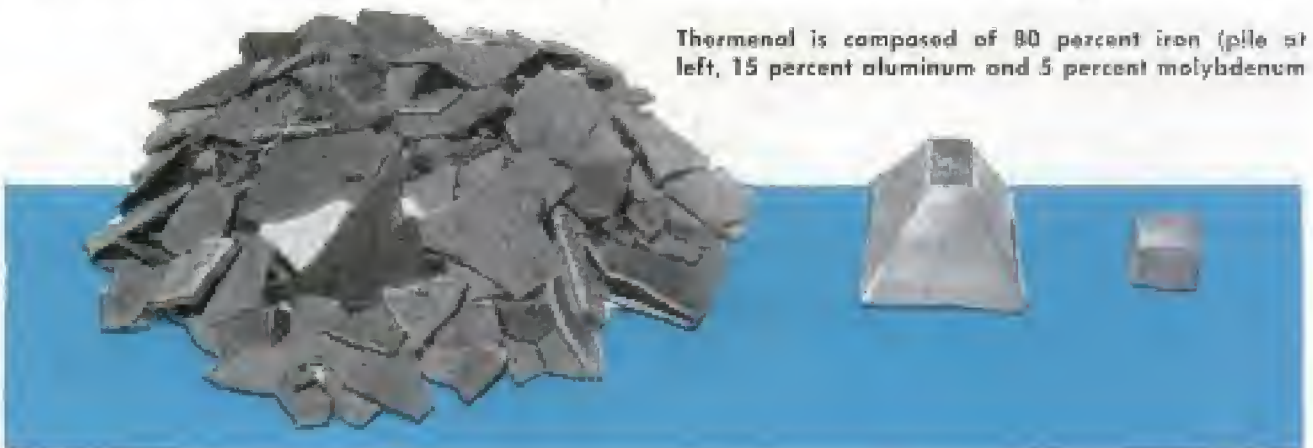
Because the metal uses no critically

scarce materials, it promises to conserve supplies of nickel, cobalt and chromium.

Birthplace of the metal is the Naval Ordnance Laboratory at White Oak, Md. Scientists there were working with 16-alphenol, a rock-hard magnetic metal composed of 84 percent iron and 16 percent aluminum. The alloy was lighter than stainless steel and was almost impossible to burn up. But it had no strength at high temperatures and was therefore useless in jet engines.

The scientists tried adding noncritical al-

Thermenol is composed of 90 percent iron (pile at left, 15 percent aluminum and 5 percent molybdenum





Laboratory worker pours molten Thermenol into mold. Metal is hot rolled and later rolled under moderate heat

loying materials. One of these was molybdenum. Results were spectacular.

The new metal, which they named Thermenol, had all the advantages of 16-alfenol, but with a high-temperature strength 100 times greater. The metal measured up to some specifications for stainless steel and surpassed others. While it cannot replace the "superalloys" needed for extremely hot applications, it is good enough to substitute for sheet stainless steel in jet tail cones, exhaust systems and many others.

From 20 to 25 percent lighter than ordinary stainless steel, it could lessen the weight of existing aircraft. It is very hard and has a high tensile strength. It resists corrosion and oxidation, takes a high polish

and holds it. Thus, it may someday serve as a bright, permanent trim for automobiles.

The metal resists electricity 50 percent more than does chrome-nickel wire, the material now used in the heating elements of electric toasters, annealing furnaces and similar applications. Because it is lower in cost and produces more heat, volume for volume, than chrome-nickel wire, it may see wide use in this field.

Less than 50 pounds of the new metal has been produced. But, according to a Laboratory spokesman, large-scale production is probable. When that happens, he says, "stainless steel will not be able to compete with it because of Thermenol's low-cost, noncritical components." ★ ★ ★

After a week in a beaker of nitric acid, Thermenol, at right, was undamaged. Sample of iron in the same test was badly corroded. Metal would keep its shine when used as trim for autos



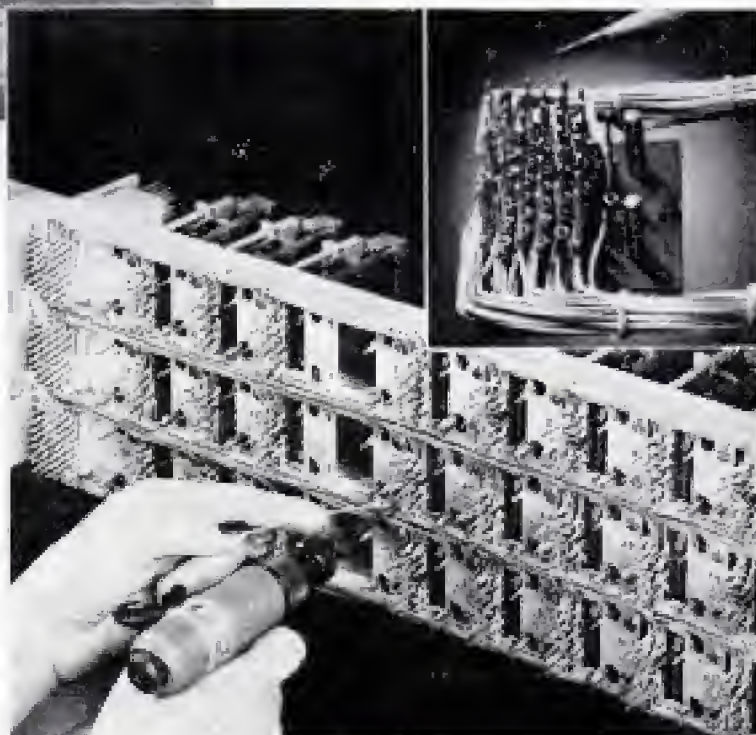


Navy Antisub Helicopter Equipped With Sonar

Another weapon against submarines is a new helicopter that detects them with sonar equipment. Sonar gear hung from a cable is lowered into the ocean by the hovering copter. The crew can then listen for the echoes of submerged submarines. The helicopter is the Navy's new Sikorsky XHSS-1, recently exhibited in a public demonstration for the first time. The helicopter could patrol large areas from a cargo ship.

Wire-Wrapping Gun Uses No Solder

Without the use of solder, a new wire-wrapping tool produces a tight joint between a terminal lug and its connecting wire in the assembly of electric and electronic equipment. The tool is a hand-held gun that wraps the bare wire tightly around the terminal. The wire is inserted in an opening in the hollow gun tip, which then is placed over the terminal. When the tip rotates, it virtually shoots the wire around the terminal in a strong metal-to-metal joint. The gun can be operated either by air or electricity.



~~American~~ German Microfilm Camera Shoots Both Sides of Card

Fronts and backs of filing cards are photographed simultaneously as they roll through a microfilming machine. The device was exhibited at Düsseldorf, Germany. It is priced at 24,000 marks—approximately ~~\$5710~~ **3500**.

Fluorescent-Lamp Dimmer

Fluorescent lamps may be dimmed or brightened by a simplified low-cost control developed by General Electric. The dimmer will control light output of up to twenty 40-watt bulbs. It employs a control of the type used for dimming incandescent lamps in combination with a special rapid-start ballast.

Revolving Drum Turns Canned Milk

Milk turning used to be quite a job at the Naval Supply Depot in San Diego, Calif., until someone mechanized the process. Condensed milk in storage tends to separate like paint, so each carton was turned over by hand at least once a month. Now 36 cases at a time are hoisted by a fork lift and placed inside a mechanical turner. Another pallet is placed atop the cases. Wheel rims ride on revolving trucks in the base of the device as the entire load is turned by hand in a half circle. The upside-down cases are then removed from the opposite side by another fork lift and stacked in storage. Almost two thousand cases can be turned per hour.



Meter Tells Planting Date For Desired Harvest

Slide-rule techniques now have been put to work for the gardener. A new Cropmeter which is actually a slide rule in dial form tells the gardener when to plant hundreds of species of vegetables so he can harvest them on the dates he desires. This enables him to raise an even flow throughout the season without periods of overproduction or scarcity. In the instruction book is a map dividing the country into 10 growth zones. When the gardener has found the proper zone for his location, he can set the date he wishes to harvest a particular vegetable on the meter, and then calculate the proper planting date. The figures are based on average climatic conditions for each zone.

Tractor Rides Pickaback On British Road Roller

Power and weight for a British road roller are provided by a farm tractor that rides pickaback. The tractor is backed up a portable ramp onto its carrying frame, then lifts its rear wheels clear by its own hydraulic implement linkage. The chain drive to the rear rollers is from a sprocket bolted to the hub of each wheel. A steering wheel is linked to the front roller.



TAXI UP MISERY MOUNTAIN



Cobbie Labbe checks in after stormy ride down the mountain in a Sno-Cat. Weasel driven by assistant, below, is faster





A Sno-Cat picks its way down the Winter Cutoff, a risky short cut that skirts the edge of the Great Gulf

IF YOU dislike winter driving, you won't envy Phil Labbe. Labbe runs a year-round taxi service up to the top of Mount Washington, a stormy peak in New Hampshire that has the wildest winter weather in America.

It has been found to be a perfect spot for the testing of jet-aircraft engines. Arctic experts say it has the fog and wind of the Aleutians with the snow and cold of Labrador.

Labbe's route up to the jet-engine testers and scientists on top rises almost a mile in altitude as it twists and turns over eight miles of snow and icy rock. To fight the mountain, Phil has courage, skill and a choice of three types of weapon: Weasel, Sno-Cat and bulldozer. But often, when a "taxi" breaks down or a man is lost in a swirling blizzard, Labbe must supplement his mechanical

By
William Gilman



Labbe keeps a 'dozer on top of mountain in case vehicles can't get through from below. Keeping the road clear is constant job



Exit end of wind tunnel juts from icing-research hangar at summit. Savage weather is ideal for test purposes



and driving skills with his own two legs. In summer Phil carries up supplies and men in a Jeep or a truck. Tourists journey up the old graveled "Carriage Road" to view what P. T. Barnum called "the second greatest show on earth." Others ascend the other, western side of the mountain

Below timber line, left, weather is calmer. Radio and telephones, below, link summit and base of mountain





Lobbe's Sno-Cat "taxi" hugs the edge of the Great Gulf, a 1500-foot drop. A bulldozer cleared the way

on the freak Cog Railway now owned by Dartmouth College.

In New England's tourist weather, the mountain is usually safe enough for people who follow instructions. For others, especially in winter, it can be a trap that shuts fast. Thirty-eight people have perished on its slopes, most of them from ex-

icing conditions at top of mountain built up a huge mass of frost rime around single upright two-by-four



NOVEMBER 1954

posure or from injuries received in falls.

Last winter a pair of would-be arctic explorers from Harvard University camped in Tuckerman Ravine, a great bowl that fills up with 90 feet of snow and is famed for its spring skiing that lasts into June. They died there. One was killed in his igloo by an avalanche; the other perished from exposure while trying to flee to safety.

During its long winters, Washington is known as "Misery Mountain." It is then that the arctic vehicles supplied by Labbe's employer come in handy. Phil is hired by the Mount Washington Laboratory, an Armed Forces project under Army Capt. John Hitchcock and operated by the icing-research experts of Smith, Hinchman and Grylls, Inc.

Phil, who used to drive a bulldozer for a logging outfit, is "at-home" on crawlers.

But Misery Mountain knows some tricks, too. Up above timber line—in the three miles between the "Horn" and the "Home-stretch"—a traveler caught in fog or storm can easily wander off the road, despite the stone cairns which have been placed along the way to guide him.

Even in quiet weather the area can be treacherous. There are places which become ice traps with glacierlike accumulations of snow and rain. Soft new snow atop this can both hide and lubricate the trap.

Four years ago, the first winter with a

(Continued to page 234)



Radioactive-Tire Test Quickly Measures Wear

"Hot" tires—manufactured with radioactive phosphor in the treads—are giving wear-test data in days instead of the months required by a standard road test. One method employs a Geiger counter, mounted on a small cart behind the rear wheel, which scans the track of the tire as it rolls along. A radiation meter in the cab tells how much tire tread is wearing off onto the road. To measure the amount of rubber particles blown into the air, an air scoop feeds the particles into a vacuum-cleaner hose where they are trapped by a paper filter.

Camera Photographs Check Passers

Check passers and their checks are photographed by a device that holds a two-lens 35-mm. camera and 6000 feet of film. A vertical lens makes a picture of the check passer's check and identification card while a horizontal lens takes a picture of him. Both pictures are recorded on the same frame.



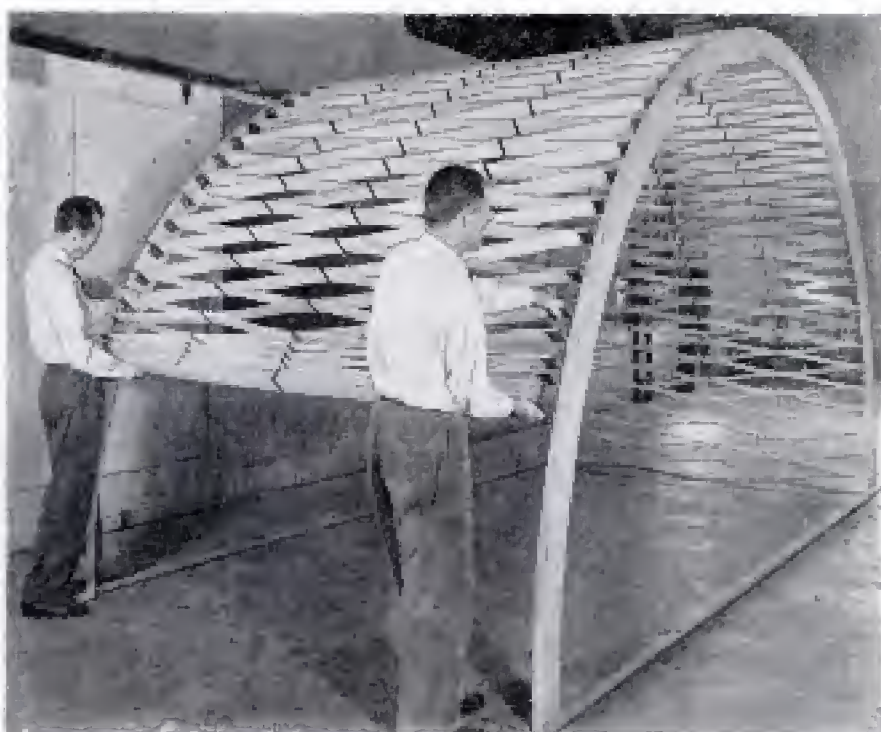
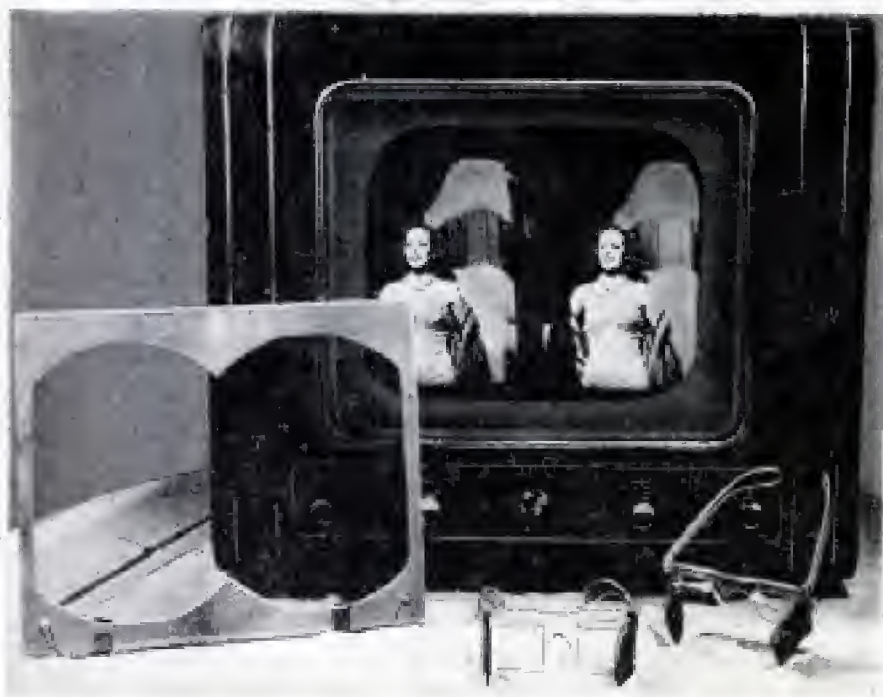
Preformed Church Steeple Constructed on the Ground

At first glance it appeared to be a powerful rocket ready for launching—but residents of Wausau, Wis., knew that the strange, needle-nosed object was actually the steeple of the new church being erected. To bypass special scaffolding, the 50-foot wooden steeple was built on the ground in an upright position, then finished to a point that could easily be reached by workmen on the roof. Cement building blocks in the base and guy wires kept the steeple upright as it was raised into position by a crane.

More aluminum was produced in the United States during 1953 than in any previous year—a total of about 1,250,000 tons of primary (new) metal.

Viewers Wear Polarized Glasses to Watch 3-D TV in Germany

Three-dimensional television recently was transmitted by a station in Berlin. Two different images were transmitted, as in any true three-dimensional effect, and picked up on standard receivers during the test. Viewers wore polarized glasses to obtain the three-dimensional effect. A mask which separated the two images was placed in front of the receiving screen to produce a picture with clear-cut edges. The 3-D picture, of course, was only half as large as the receiving screen, dividing it into two vertical pictures.



Veneer Slats Support Roof

Lightweight roofing, such as plastic, plywood and thin metal, is supported uniformly by a lattice of wood slats. The slats, which are fastened together by metal strips, are supported by metal slots on each side. Smaller framing members can be used because the weight of the roof is distributed uniformly. The slats, which come in packages eight feet long and nine inches thick, are expanded as they are applied. One unit, containing 32 slats, covers 64 square feet. The slats are made of three-ply oak veneer, are about three inches deep and $\frac{3}{16}$ inch thick. The underside of the slats may be left unfinished to provide a decorative surface, or covered to furnish a dead-air space for insulation. Because the material conforms to curves, it can be used in a wide variety of structures, such as warehouses, farm buildings, carports, and porches. It is quickly installed.





Homemade bell is attached to fishing rod. Rod handle rests in holder stuck into plank or ground. Waiting for fish, lower right, Evanoff catches up on reading



Fishing Rod Rings Bell When There's a Bite

When Ben Evanoff of Detroit, Mich., goes fishing, he can safely read the paper while waiting for the fish to bite. Evanoff has designed a rod holder to free his hands and an alarm that signals a bite. The holder consists of two rings cut from an old auto steering column and welded to a heavy steel wire. The handle of the fishing rod is inserted through the rings and the wire shoved into the ground. The alarm is a little homemade bell which clamps on the rod. When the bell rings, Evanoff drops his reading matter, grabs the rod and reels in the fish.



Wide Ski With a Seat Permits You to Slide Sitting Down



You can ski down a slope sitting down with a ski that mounts a seat. Large enough for adults, it consists of a 54-inch ski with a sturdy wooden post supporting a wooden seat. The seat contains thumb-and-finger grips to allow a good grasp during the descent. Steering and braking are done with the feet. The sit-down ski is intended primarily for use on small slopes or hills, away from regular skiing areas.

Sources of available products described in this issue are listed on pages 12, 14 and 16. Sources of further information on other articles are listed in our free WHERE-TO-FIND-IT LIST. For your copy just write to the Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11, Illinois

Radio Television Electronics

TELEVISION TODAY

THE TREND in home decor toward built-in-furniture units has just found a new friend in a West Coast TV manufacturer who recently announced three new built-in-television units for installation in walls. On a roller-and-track system for easy servicing, as illustrated in photo A, each unit is actually two units. The chassis and picture tube, safety glass and controls are packaged together, with the shadow box and front molding. The sound systems, each with their own moldings are separate, permitting installation anywhere in the room for maximum reception. One high-fidelity sound-system unit includes two 10-in. woofers, a tweeter with diffusion horn, crossover network and 10 watts of push-pull audio amplification with bass and treble controls.

The "girl in the iron mask," photo B, is a trained technician, shielded by a welding mask, expertly joining the faceplate section of an RCA tricolor television-picture tube to the main cone of the tube. The welding operation provides a rugged airtight seal.

The Phantom Feed-Thru is the trade name for the gadget shown in photo C which permits the TV antenna to be brought through the glass. This eliminates drilling through the window frame or wall which involves defacing the house. It is claimed that no signal loss results.

A decorative touch in indoor antennas appears in photo D. Called the Wonder Bow, this TV antenna is claimed to provide ideal reception in city areas on all television channels including VHF and UHF.



DX TELEVISION-STATION RECEPTION

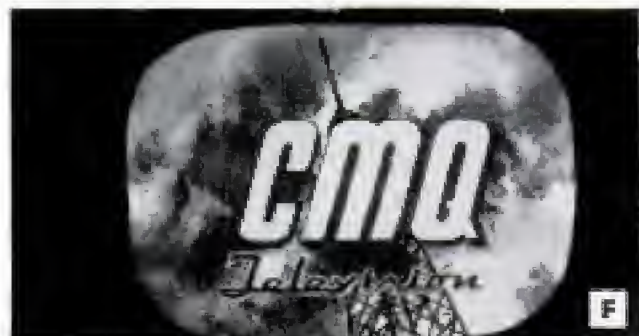
By Max Tharpe

VERIFIED RECEPTION of distant (DX) television stations may well be the beginning of a new hobby "TV-DX." It not only presents problems of TV-antenna selection, but it also offers an interesting study of weather conditions, sun-spot activity and atmospheric conditions which are favorable to distant TV reception.

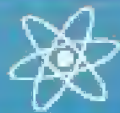
Radio hams and short-wave listeners often take advantage of these freak conditions to log DX radio stations on the very-high-frequency (VHF) bands that are normally not considered good for distance. During these periods of freak reception, TV signals from many hundreds of miles can be pulled out of the sky by any good TV receiver that is tuned to the right channel at the correct time. When such conditions have been favorable, the writer has been receiving clear pictures and sound in Statesville, North Carolina, from as far away as Denver, Colorado, a distance of about 1350 miles. As atmospheric conditions varied TV pictures and sound from many other points were tuned in clearly. Sometimes it is possible to enjoy reception for several hours from even the most distant stations. The real thrill is in the satisfaction of seeing big clear call letters at station-break time from some distant station. Then, with camera ready as in photo A, you get your own verification on film.

To add to the suspense, an unidentified station may be loud and clear up until just before the station break—then fade out completely before it is identified. Often a station after coming in clear for some time may become lost in a scramble of stations as the freak conditions affect more stations on the same channel.

The verification screen photos shown are as follows: Photo B, Denver, Colorado; C, Wichita Falls, Texas; D, Montreal, Canada; E, Dallas, Texas; F, Santiago, Cuba; H, Temple, Texas; I, St. Joseph, Missouri; J, Savannah, Georgia; and K, Winston-Salem,



VERIFIED WITH SCREEN PHOTOS



North Carolina. However, there are many others in the writer's collection. The latest improvement in my TV-antenna array is shown in photo G; the rotor motor appears just below the peak of the roof. This rather elaborate array now also includes a stacked UHF reflector on top.

By combining a sensitive 1954 TV receiver with this rotary all-channel TV antenna, it is possible to select programs from 10 clear stations almost every night in the year. The rotator makes it possible to turn the entire antenna array in any direction by means of a remote-control unit at the receiver. In many cases this helps to clear up the distant signals. Although special antenna arrays and TV boosters are a great help in bringing in a large number of stations, a simple TV antenna at the proper height will often bring clear pictures and sound from distant points when freak conditions are active.

A tip for the TV-DXer is when viewers complain about distant TV stations interfering with their reception. This disturbance pattern is a guide as to when distant stations are coming through. Since the TV signal does not bend with the curvature of the earth, its reception usually fades out at a distance of 100 to 200 miles from the transmitting station. Normally the VHF TV sky wave travels on into space as the low angle of reflection from the Heaviside layer is not sufficient to bring it back to earth. The Heaviside layer, or ionosphere, acts as a mirror in the upper atmosphere above a height of about 60 miles, see Fig. 1. These ionized layers are subject to continuous change and sometimes the angle of refraction is changed so that the signals are reflected back to earth again and can be picked up in the area where they strike; this is the freak condition referred to.

When photographing the screen of the TV set, an exposure of $\frac{1}{3}$ second at f:5.6 should make a good picture if you use a tripod. Do not use a flash, as the brilliant light will wash out the picture. ★ ★ ★



G



H



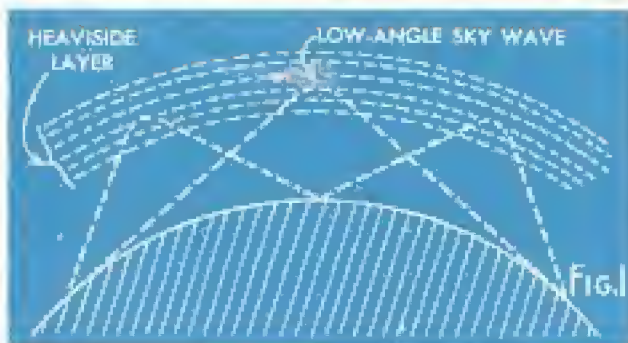
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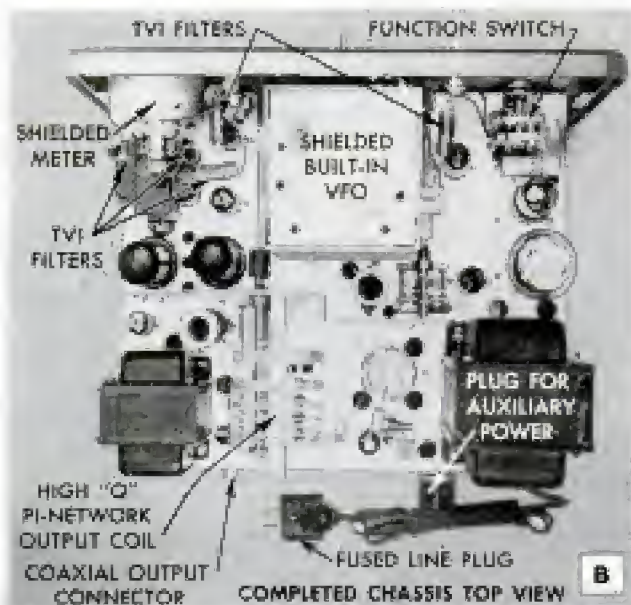
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K



SEVEN-BAND CW AND PHONE TRANSMITTER IN KIT FORM

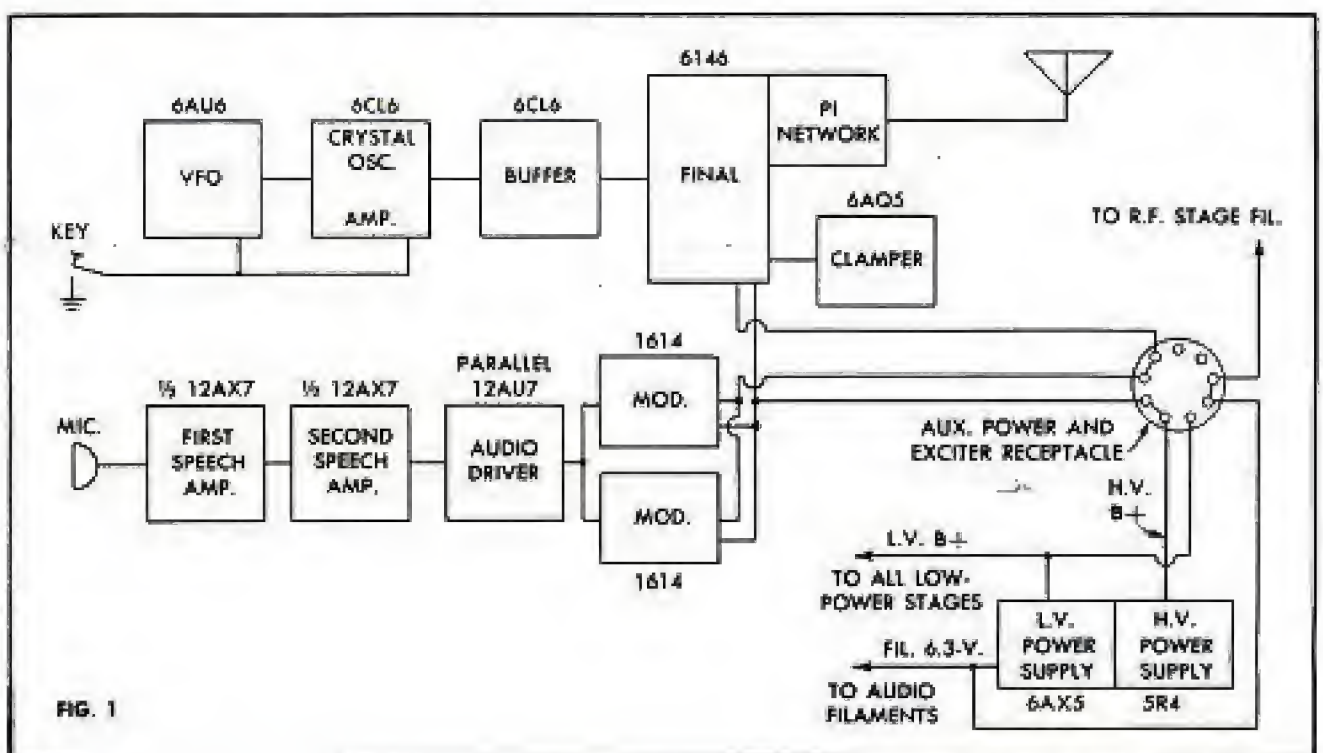


PLANNED for easy assembly, this versatile and compact kit transmitter is specially designed for the advancing novice or experienced amateur. It is a complete self-contained 75-watt input CW and 65-watt phone transmitter with built-in variable-frequency oscillator (VFO). The use of crystal control is also conveniently provided for if desired.

It is interesting to note in photo A that this ultra-compact transmitter, being operated by John E. Magnusson W0AGD, is smaller than the communications receiver at his left. An important feature is efficient television-interference suppression, provided by complete shielding and filtering; the unit can also be used as a flexible exciter rig without modification. The r.f. and audio sections may be used separately to drive larger amplifiers. For example, the 6146 final can be used to excite a high-power r.f. amplifier, while the speech amplifier and modulator section provide the necessary audio gain and power output to drive the grids of a high-power Class B modulator. The Novice Band operator, looking forward to getting his higher-grade license, will appreciate the fact that he has a complete foundation for a much larger rig.

Operating on 160-80-40-20-15-11 and 10 meters, VFO or crystal, it is easy to tune as the basic tuning controls are located on the VFO dial.escutcheon. A block diagram of the transmitter is shown in Fig. 1. The built-in VFO in this Viking Ranger transmitter is patterned after the well-known

(Continued to page 256)



the

POPULAR MECHANICS

CRAFTSMAN

FOAM RUBBER Simplifies Upholstering

Have you a piece of furniture that needs upholstering but are afraid to tackle the job yourself? Foam rubber and sagless-type springs now make upholstering at home easy



STRIPPING a sagging, overstuffed chair down to the frame is easy for anyone but building it back up again is a job not many care to undertake. The task of tying countless springs together and the work of adding cotton and hair padding are complicated steps that make upholstering difficult for the novice to master.

However, what was once a trying job is now actually fun. New sagless-type springs, which are merely hooked to the frame with special clips, do away with tedious tying, and resilient foam rubber, which is cemented in position, takes the place of padding without the drawbacks of matting and shifting.

On this and the following eight pages, John Bergen, in cooperation with the U. S.



**TABLE FOR DETERMINING
NUMBER OF SAGLESS STRANDS, PROPER
SPACING OF CLIPS AND CORRECT SIZE OF SEAT
HELICALS, EXTENSION SPRINGS FOR CHAIR AND SOFA SEATS**

Distance Between Arms Along Front Rail	Number of Sagless Strand	Center- to-Center Spacing For Clips	Center Spacing of Two Outside Clips From Inside Arm Posts	Seat, Helical and Extension Spring Size
21" Chair	5	4 $\frac{1}{4}$ "	2"	2"
22" Chair	5	4 $\frac{1}{2}$ "	2"	2"
23" Chair	5	4 $\frac{3}{4}$ "	2"	3"
24" Chair	5	5"	2"	3"
24" Chair	6	4"	2"	2"
25" Chair	6	4 $\frac{1}{4}$ "	1 $\frac{7}{8}$ "	2"
58" Sofa	12	5"	1 $\frac{1}{2}$ "	3"
59" Sofa	12	5"	2"	3"
60" Sofa	13	4 $\frac{3}{4}$ "	1 $\frac{1}{2}$ "	3"
61" Sofa	13	4 $\frac{3}{4}$ "	2"	3"
62" Sofa	13	4 $\frac{3}{4}$ "	2 $\frac{1}{2}$ "	3"
63" Sofa	13	5"	1 $\frac{1}{2}$ "	3"
63" Sofa	14	4 $\frac{1}{2}$ "	2 $\frac{1}{4}$ "	2"
64" Sofa	14	4 $\frac{1}{2}$ "	2 $\frac{3}{4}$ "	2"
65" Sofa	14	4 $\frac{3}{4}$ "	1 $\frac{5}{8}$ "	3"
66" Sofa	14	4 $\frac{3}{4}$ "	2 $\frac{1}{8}$ "	3"
67" Sofa	15	4 $\frac{1}{2}$ "	2"	2"

Where distance between arms is in half inches use table for next smaller or larger size and set each outside clip $\frac{1}{4}$ " farther away from arm post (if table for smaller size is used) or $\frac{1}{4}$ " closer to arm post (if table for larger size is used).

Rubber Co. and the No-Sag Spring Co., shows how simple it is to upholster both old and new furniture using these two new products. Full-size plans, plus material lists, are available for constructing the frames for the new pieces of furniture which are pictured on the first three pages.

This new-type spring is sold under the trade names of No-Sag and Zigger Wire and is manufactured in strip form from spring-steel wire which is bent in a zigzag pattern. The wire does not actually become a spring until it is uncoiled and stretched and anchored at each end to the seat or back frame. Sagless-type springs are sold both in ready-cut lengths and in coils up to 160 ft. long. Springs of No. 8 to 11-ga. wire are recommended for seats, while springs from No. 10 $\frac{1}{2}$ to 12 $\frac{1}{2}$ ga. are best for backs.

Measuring springs for length: The comfort and resiliency of sagless-type springs will depend entirely on the correct arc, gauge of the wire and length of the springs. The greater the arc, the more resilient the seat. Never make the arc greater than 2



Above, attractive sofa bed is practical answer to small quarters of studio apartment or den. Dual-purpose feature provides roomy couch by day and with bolster removed, a comfortable bed by night

Below, another example of how foam-rubber padding gives neat tailored look to this Davenette. Author John Bergen has prepared full-size plans for the frame of this piece as well as the others shown above

TABLE OF GAUGES AND SIZES OF SAGLESS-TYPE SPRINGS FOR SEATS

Inside-Seat Dimension	Gauge	1 1/4" Arc	1 1/2" Arc	1 3/4" Arc	2" Arc
12"	11	11 3/4"	12"	12 1/2"	
13"	11	12 3/4"	13"	13 1/2"	
14"	10 1/2	13 3/4"	14"	14 1/2"	
15"	10 1/2	14 3/4"	15"	15 1/4"	
16"	10	15 3/4"	16"	16 1/4"	
17"	10	16 3/4"	16 1/2"	16 3/4"	
18"	9 1/2	17"	17 1/2"	18"	
19"	9 1/2	18 1/4"	18 1/2"	18 3/4"	
20"	9	19"	19 1/2"	19 3/4"	20"
21"	9	20"	20 1/2"	20 3/4"	21"
22"	8 1/2	21"	21 1/4"	21 3/4"	22"
23"	8 1/2	22"	22 1/2"	22 3/4"	23"
24"	8 1/2	23"	23 1/4"	23 1/2"	24"
25"	8	24"	24 1/4"	24 1/2"	25"
26"	8	25"	25 1/4"	25 1/2"	26"
27"	8	26"	26 1/4"	26 1/2"	27"

Inside-seat dimension is the distance between the inside of the front and back rails. Sagless springs cut to this exact length will give you the normal arc. It varies from 1 1/4" to 2" increasing with the length of the spring as shown above. When clip is not attached to inside edges of frame, clip-to-clip dimensions can be used instead of inside dimensions.

in. high without using a hinge link, which is a U-shape wire connector applied to the end of the spring at the back seat rail. To measure sagless-type springs for length, hold one end of the uncoiled spring on one end of a yardstick. Then roll back the other end of the spring until it lies flat on the yardstick. The distance between the extreme outside edges of the bent ends is the correct length of the spring. Avoid measuring with a flexible-steel tape around the curve shape of the spring as this will give an incorrect measurement. Springs that are sold already cut are measured by the yardstick method.

Cutting and bending ends of springs: When the spring wire is purchased in coils, it must be cut into individual springs of the proper length, after which the ends must be bent back slightly. The wire can be cut either with a file or fine-tooth hacksaw blade. With a file, a notch is made in





Threadbare occasional chair, above, becomes like new with foam-rubber padding and red plastic upholstery



A little redesigning, the magic of foam rubber and re-covering with new fabric revived the castoff easy chair pictured above. The slat bench in playroom, below, is upholstered with foam rubber and plastic



the wire while it is clamped in a vise and then the wire is bent back sharply to snap it off. Bending back of the ends is done by clamping the spring in a vise and hammering the end back. Bending the ends back is necessary to prevent the springs from slipping out of the clips which are used to anchor them to the wooden frame. When the springs are purchased ready-cut to length, they come with the ends already bent.

How springs are installed: The special metal clips which hold the spring ends securely to the frame are nailed in place first. The chart given on page 162 recommends the number of springs needed in the seats and backs of certain size frames and also gives the correct spacing of the clips. Mark the location of the clips on the rails of the frame. When the seat tapers to the back, the outside clips on the back rail should be placed the same distance in from the sides as they are placed at the front. The other clips for the back seat rail are spaced evenly between the outside clips. On large seats, the second clip from the outside on the back seat rail is spaced evenly between the outside clip and the normal position of the third clip. The springs are always installed between the front and the back seat rails in the case of the seat, and from the top rail to the back liner when springing the back of a chair. The only exception is when the seat and the back are upholstered together in one continuous form. Then the springs are installed between the side seat rails and between the back posts.

When nailing the clips in place, be sure each clip overhangs the inside edge of the frame at least $\frac{1}{8}$ in. This allows the spring to swivel freely inside the clip and prevents noise that might otherwise result from restricted spring movement. It is best to install all clips in their respective positions with one nail before hooking the springs in place. In placing the springs, it is important to alternate the direction of

Sagless-type springs are installed in back by nailing lower clips closed and drawing springs upward



First step is to nail spring clips to frame. Note wire hinge links along back rail. Links plus clips are used at rear rail when greater spring arc is desired



the bent ends. For example, if the bent end of the first spring points to the right, the bent end of the adjacent spring should point to the left. Alternating the direction of the bent ends of the springs brings closed loops opposite each other, thus permitting helical and retainer springs to be applied to the sagless-type springs in a straight line. Alternating the bent ends of the springs also is necessary to permit installing edge springs.

Installing springs in seat: When all the clips have been nailed to the frame, you are ready to install the springs. To determine the gauge and length of the springs needed for the particular frame at hand,

measure the frame from the inside of the front rail to the inside of the back rail. Then consult the chart on page 163 to find the length and the gauge of the springs needed. Keep the arc about 2 in. high. This will make the most resilient seat.

Each spring is installed individually by first hooking it in the open clip at the back seat rail and then nailing the clip shut. After this the spring is pulled forward, hooked in the clip at the front rail and the clip is nailed shut as before. As sagless-type springs are quite stiff and thus require a good deal of pull to stretch them, you should make sure that the clips are well nailed and that you have a good hold

Next, the springs are covered with burlap. Long running stitches are used in sewing it to the springs

Tacking strips of muslin, cemented to edges of foam-rubber pad, serve to secure rubber in place on seat





Above, small helical springs tie sagless-type springs together crosswise in both seat and back. Below, foam rubber, covering arms of chair, is cemented at seams



Above, chair arms are covered on inside with furniture webbing. Back and seat have already been covered with burlap. Below, photo shows chair padded with foam rubber and ready for fabric cover. Cotton is used to pad arms on outside



Below, fabric cover is applied to outside face of arms last. First, welting is tacked all around outer edge of arm. Then fabric is blind-tacked along top edge by tacking through cardboard strip and rear side of fabric. Cardboard is concealed when fabric is pulled down



on the spring. One of the best ways to stretch the springs is to grip the free end with the claw of a hammer. With the hammer held in the right hand, left hand is used to press downward on the crown of the spring as it is pulled forward and hooked in the clip. As each spring is stretched in place, remember to alternate the direction of the bent ends.

Helical springs installed next: Helical springs are used to connect the sagless-type springs together crosswise so they will function as a unit and spread the seating load evenly over all the springs. When installing the helical springs, be sure the open hook of the coil is placed downward so that the hook will not snag the burlap covering and foam-rubber padding. At least two rows of helical springs should be used, three are better. These are anchored to the side seat rails with retainer plates which are sheet-metal hooks that are nailed vertically to the outside face of the rails. The plates should be spaced evenly three or four spring loops apart along each rail, and should be nailed at a height on the rail that will permit a straight sideward pull against the outside row of sagless-type springs.

Applying springs in the back is done practically the same as described in springing the chair seat. Here, the



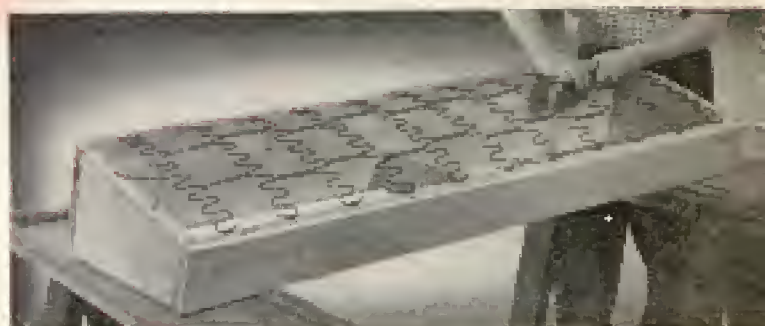
After foam rubber is applied to bolster, the rubber is cut with scissors all the way through to burlap. This allows the bolster to be deeply tufted when it is covered



Above, wooden frame to which sagless springs are applied and then covered with burlap, is designed to take standard, cored foam-rubber mattress. Below, helical springs are added to sagless springs of bolster

springs are stretched from the back liner (lower crossrail) of the frame to the top rail. Two or three rows of helical springs are installed across the back as was done in the seat. However, the springs at the ends of the rows are held to the frame with staples instead of retainer plates. After all the springs are installed in both the back and seat, the springs are covered with burlap which is drawn taut and tacked to

Below, bolster is "wrapped" with fabric which is brought around and tacked to ends of frame. Separate plywood panels, covered with fabric, cap each end



Below, before foam rubber is applied, edge roll is tacked all around each end of bolster to soften the hard edges of frame and produce recess for end panels





Above, this photo of the Davenette shows it ready for the foam-rubber padding. Note the spring edge wire that is required across front of T-type seat

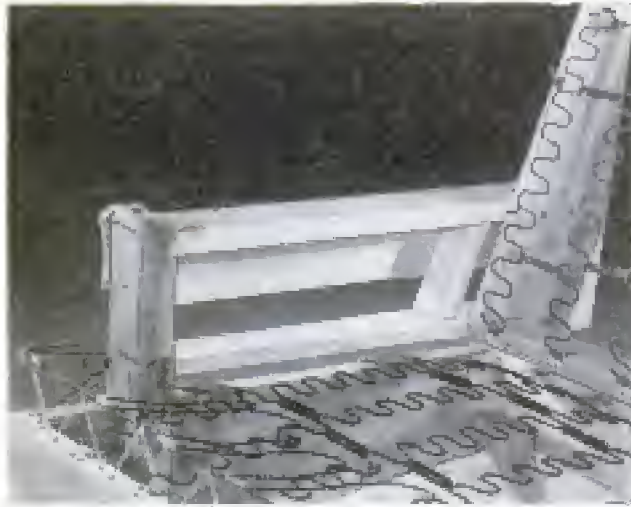
the top edges of the wooden chair frame.

Adding foam-rubber padding: Padding the springs with foam rubber is much simpler than padding them with loose stuffing, as the rubber is of uniform thickness and density. Foam rubber comes in cored and plain slab stock of various densities. Rubber of extra-soft density is recommended as a topping over back springs. Rubber of medium density is best for soft seats, with or without springs. Rubber of soft density is used for both back and seat padding. Plain slab stock (not cored) of

UPHOLSTERY ALLOWANCE

0 to 6"—Allow $\frac{1}{4}$ " over-all	36 to 48"—Allow $1\frac{1}{4}$ " over-all
6 to 12"—Allow $\frac{1}{2}$ " over-all	48 to 60"—Allow $1\frac{1}{2}$ " over-all
12 to 24"—Allow 1" over-all	60 to 72"—Allow 2" over-all

These allowances can be varied slightly when extra soft or very firm foam rubber or rubberized fiber is used. When using extra-soft stock add more to these allowances and when using very firm stock less allowance can be made.



Above, edge roll is tacked around the front of each arm to soften hard edge and prevent excessive cover wear. Notice torsion spring and how edge wire is tied



Above, close-up view of arm and corner of seat show how edge roll should look. Roll is tacked to arm and sewed to seat. Long stitches fasten burlap to springs



Here Davenette is fully padded with foam rubber. Notice muslin tacking strip across the front edge

medium density is used for padding the top and inside surfaces of arms, slip seats, benches, shaped seats and thinly padded chair backs.

A paper pattern should be made of all parts that are to be padded with foam rubber. To assure that the fabric cover will fit snugly, the foam rubber should be cut slightly larger than the pattern. Consult the chart on page 168 for proper allowance. The pattern can be traced on the foam rubber with an indelible pencil, ball-point pen or colored pencil. A few pins will hold the pattern in place while tracing. Any thickness of solid-slab foam rubber can be cut completely through with scissors. The same applies to cored stock up to 2 in. thick. In the case of heavier stock, it is best to make the first cut through the smooth top surface deep enough to sever the top of each core. Then cut through each core well. The scissors should be dipped in water frequently to lubricate them and make cutting easier.

Cementing foam rubber: Foam rubber is cemented to the burlap over the springs to hold it in place. Both the burlap and foam rubber is given a coat of special cement made for the purpose and allowed to become tacky before placing the foam-rubber slab in position. In the case of cored stock, the cores should first be dusted with talcum powder to prevent any cement from sticking that might run down inside the cores. Slabs of foam rubber may be cemented together edgewise in the same way when building up several pieces for width. After several hours, the bonded seams will be stronger than the foam rubber itself.

Applying tacking tape: Foam rubber is held to the frame with tacking tape. This is a strip of muslin which is cemented to the outer edges of the foam-rubber slab and tacked to the frame. It also helps to reinforce the edges of the rubber. The tape is applied by coating the edges of the foam rubber and the tape, a distance of 1 in. along the edge with cement, and sticking the two coated surfaces together after they have dried a minute or two.

From here on the job is completed in the normal way, pulling the fabric cover on over the foam rubber and tacking it to the frame. As a rule, a conventional muslin cover is not required over foam rubber, except where the cover is a pile fabric like cut velour.

While the steps described here have been presented briefly due to limited space, a much more detailed explanation of working with sagless-type springs and foam rubber may be found in a book written by the author, John Bergen, which covers the subject completely. ★ ★ ★

Making a Foam-Rubber Cushion



Above, solid slab stock is sandwiched between two cored slabs and then all three are cemented together



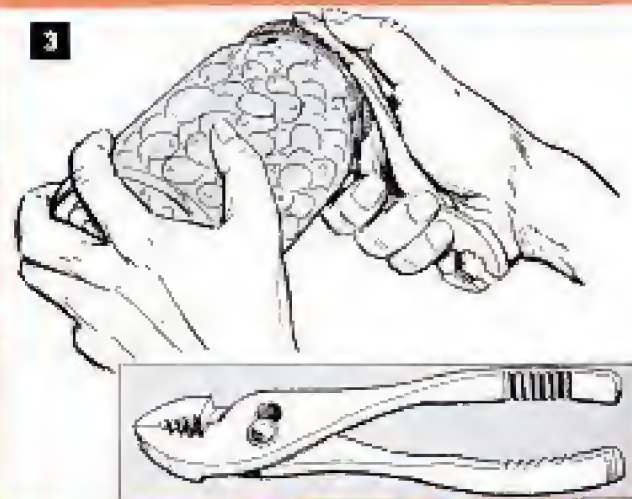
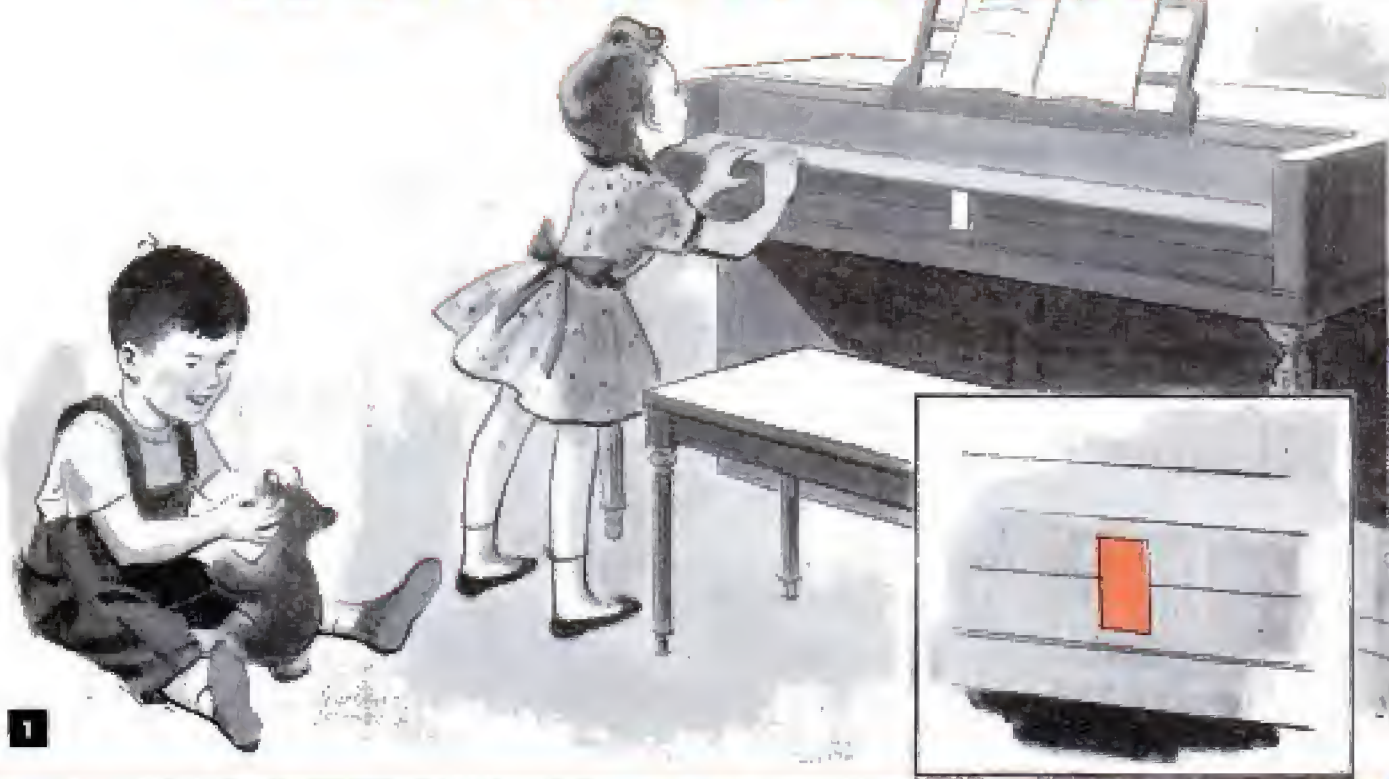
Above, strips of solid slab rubber are cemented to edges and at four corners of built-up center portion



Above, built-up foam-rubber pad is inserted in a stitched-fabric cover and then open side of cover is hand-sewn shut along welt edge of the cushion



Solving HOME PROBLEMS



1 **TO PREVENT INJURY** of children's fingers by the lid of a piano keyboard, tape the lid in the closed position whenever children are likely to play in the room. Either cellulose or masking tape may be used without marring finish of the piano

2 **METAL SALT-SHAKER CAPS** have a tendency to rust and become clogged readily during damp weather. This problem can be solved easily by coating inside of salt-shaker cap with fingernail polish, punching out holes with a pin or needle

3 **ORDINARY PLIERS** provide a handy "wrench" for opening fruit-jar lids. A row of shallow notches filed on the inside of each handle engages serrations on the side of the jar lid. This gives the handles of the pliers a good nonslip grip

4 **LOOSE DOORKNOBS** due to worn threads on a square split shaft may be tightened by sandwiching masking tape between the two parts of the shaft. Use one or more layers of tape to build up shaft thickness so threads will engage knob

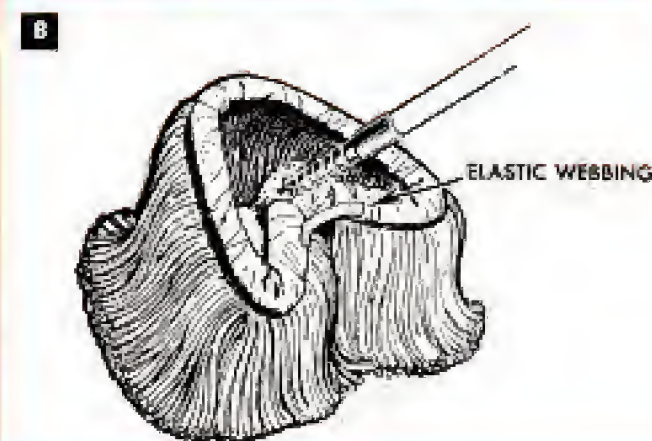
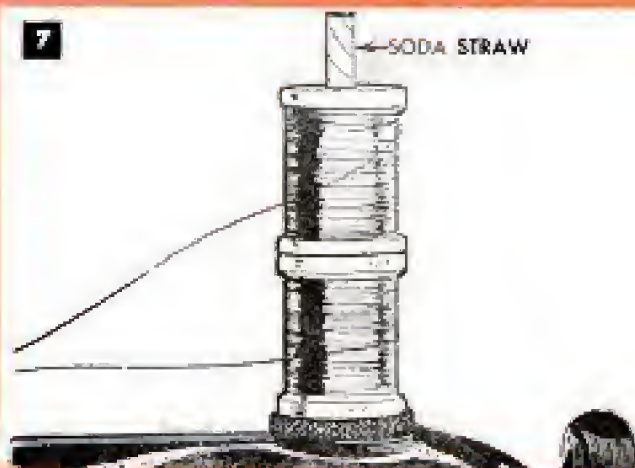
5 **SMALL PLASTIC DOLLS** of type sold at candy counters form novelty plant waterers. Doll should have holes in the top and bottom so it may be filled with water after being set in planter and slowly water plant. Drill holes if necessary

6 **BEFORE YOU PLANE** the edge of a sticking door check it with carbon paper to find which portion needs planing. Close the door over the paper repeatedly, moving the paper each time. Carbon smudges on edge of door indicate need for planing

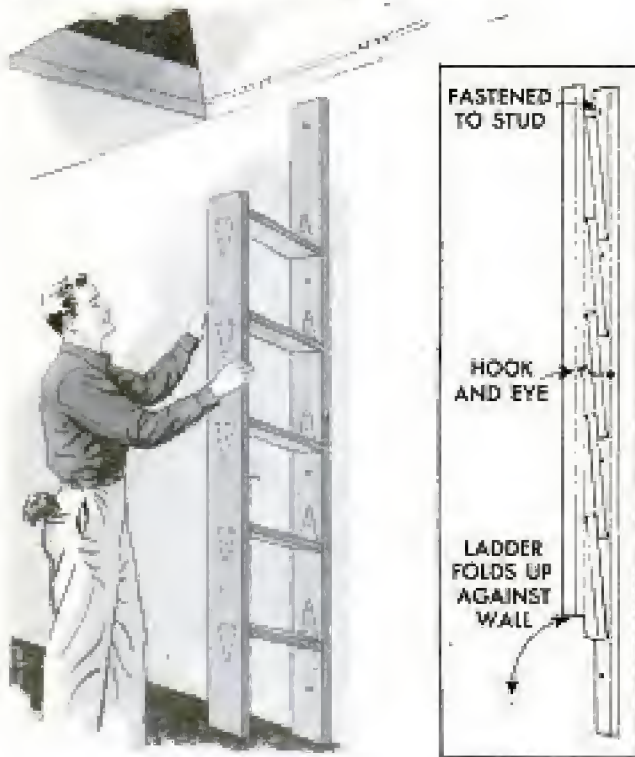
7 **TWO STRANDS** of lightweight thread used simultaneously through the needle of your sewing machine will do the trick in the absence of heavy thread. Length of spindle can be increased to hold two spools by slipping a soda straw over spindle

8 **A STRIP OF ELASTIC WEBBING** will keep dust-mop head from falling off the handle when you are shaking the mop. Simply sew the webbing across open side of the mop to keep the eyes in mop wire from spreading too far apart when mop is shaken

9 **HANGING A SCRUBBING BRUSH** from rim of pail saves time and trouble. Easiest way to do this is to make a hanger by fastening a shade-roller bracket to top of brush with wood screws. Locate bracket so it won't interfere when grasping brush



Access to Trap Door Provided By Vertical Folding Ladder



In a barn, garage or workshop which has only a trap-door entrance to a loft, and no room for a stairway, a vertical folding ladder will provide ready access. The ladder is made of 1-in. stock, hinged as shown in the detail, and one side is screwed to a wall stud with lag screws. A hook and eye holds the folded ladder flat against the wall. The dimensions, of course, will vary with the ceiling height and the most convenient tread width.

Wire-Solder Loop Holds Bottle And Prevents Spilling Liquid



The next time you have a hurry-up job at your workbench that involves an open bottle of cement, soldering acid or other liquid, use a spool of wire solder to assure that the bottle is not accidentally tipped over. Simply unroll a length of solder to wrap around the bottle, as shown in the sketch.—G. E. Hendrickson, Argyle, Wis.

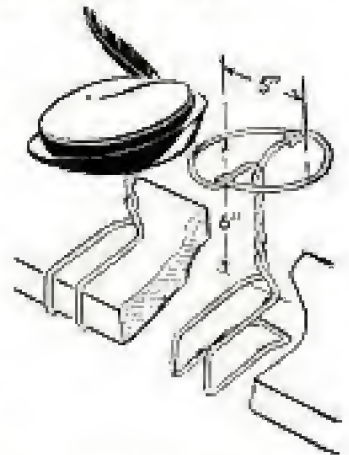
Wrench Stored on Battery Case

Should the danger exist of an electrical short circuit setting fire to a car, it is advisable to keep an open-end wrench of the proper size within easy reach for quick-

ly disconnecting one of the battery cables. One way of storing the wrench is to tie it to the battery case with a piece of string that will break when the wrench is jerked free.—Charles H. Coleman, Aurora, Ill.

Hat Holders Bent From Wire

Women's hat holders that clip to a shelf and are adaptable to any size or shape of hat can be bent from a length of No. 12-gauge wire. The wire first is bent double to form a long U-shape about 1 in. across. The parallel lengths then are twisted together for about 6 in. near the center. Next, the circle for the top end is formed and the ends twisted together and taped to cover any sharp edges. The shelf clip is shaped last and bent to fit the particular shelf on which the holders are to be used. Several holders usually can be clipped to one shelf.



Cutter for Photoprint Paper Made From Plywood Sheet

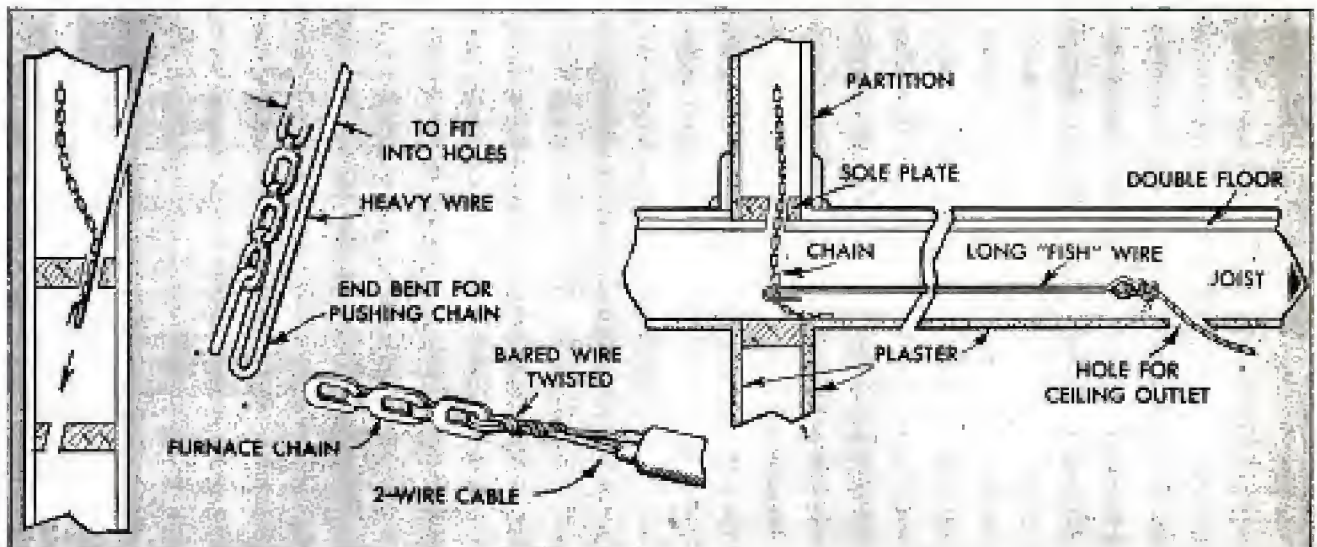
Limiting the number of various sizes of photographic printing papers, to prevent some from becoming overage, can be done by buying only the larger-size stock and cutting it to the desired smaller sizes. A simple cutter can be made by using a small sheet of plywood or hardboard. First a strip of plywood is nailed and glued to one edge of the plywood sheet. Then blocks are fastened to opposite edges and positioned so that when a steel rule is placed against them, as shown in the photograph, the desired size can be cut along the rule. A razor blade in a holder is used to cut the paper.



There's a Trick to Fishing Wires Through a Wall

When installing electrical wiring in an old house, the problem of fishing cables through the walls can be simplified if you know a few tricks. First, if a long bit, such as an electrician's extension bit, is used, the least amount of damage will be done to the wall. Start drilling just above the baseboard as shown at the right, holding the bit at an angle that will permit it to penetrate the sole plate and, if desired, the top plate of the lower partition.

Furnace chain is ideal as a lead for pulling the cable through a wall because of its flexibility, strength and ease of handling. Two tools that are useful for cable fishing are a wire guide and a long "fish" wire. The guide is bent as shown in the detail directly below, and is used to push the chain through the walls. The fish wire, shown in the right-hand detail, is a long wire with a hook formed in one end and an eye in the other. The hook is used to pull the chain through. One method of splicing cable to the chain is shown below.



Camera Bellows Kept Soft and Pliable by Wiping With Oil



Camera bellows which have become dry and stiff, presenting the possibility of light leaks from breaks in the folds, can be softened by wiping with castor or olive oil or a good leather dressing. One treatment a day, for several days, may be required to soften a bellows that has become badly dried. A bellows that is soft, pliable and in good condition can be kept that way with an occasional application of one of the dressings mentioned.

☛ To keep the interior of a fishing-tackle box in good condition, line the compartments with rubber cut from an inner tube, cementing it in place with tire-patching or gasket cement.



Designs by Pat and Jerry Goren, Seattle, Wash.

SAY "MERRY CHRISTMAS"

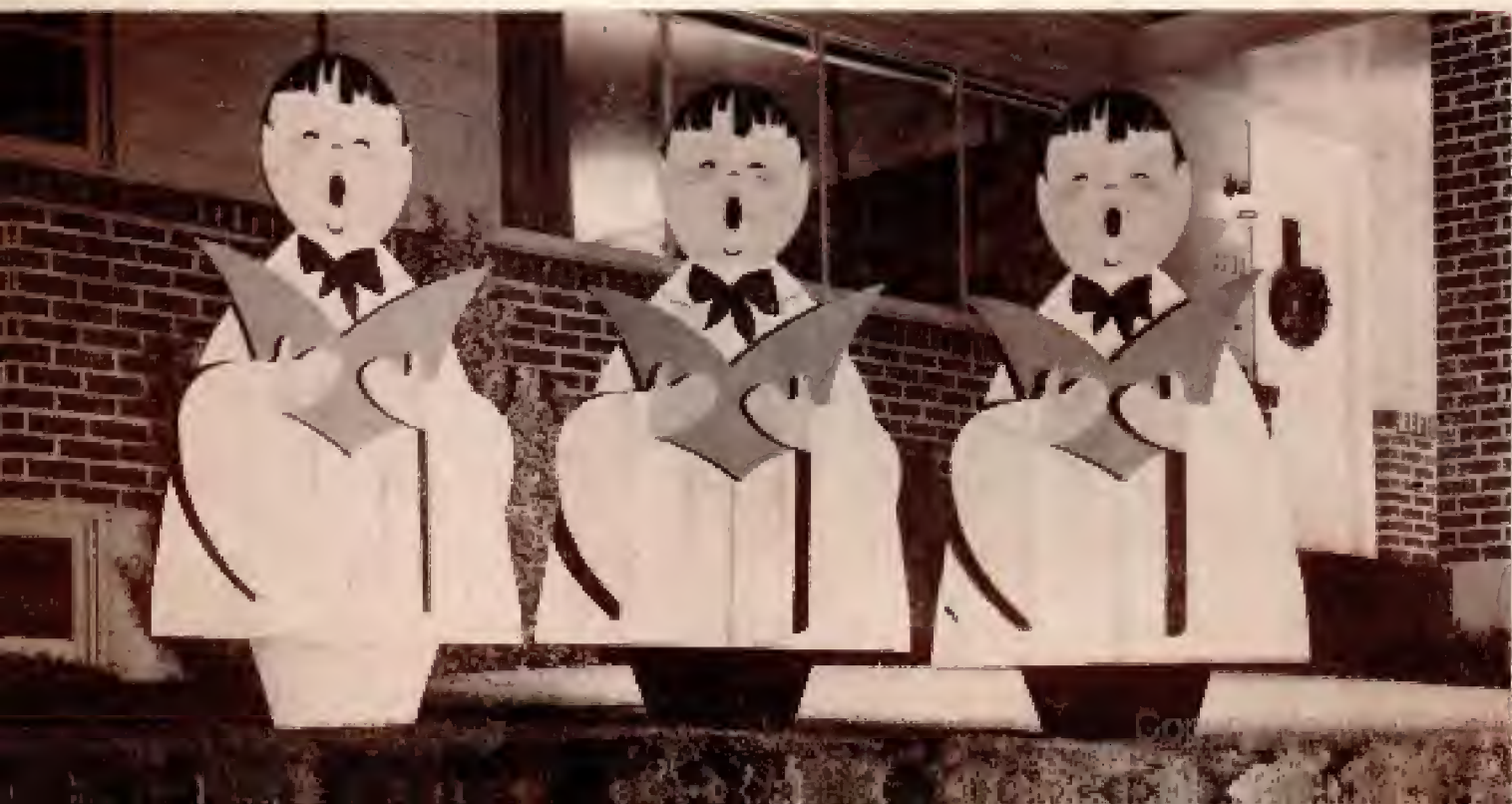
With Plywood Cutouts

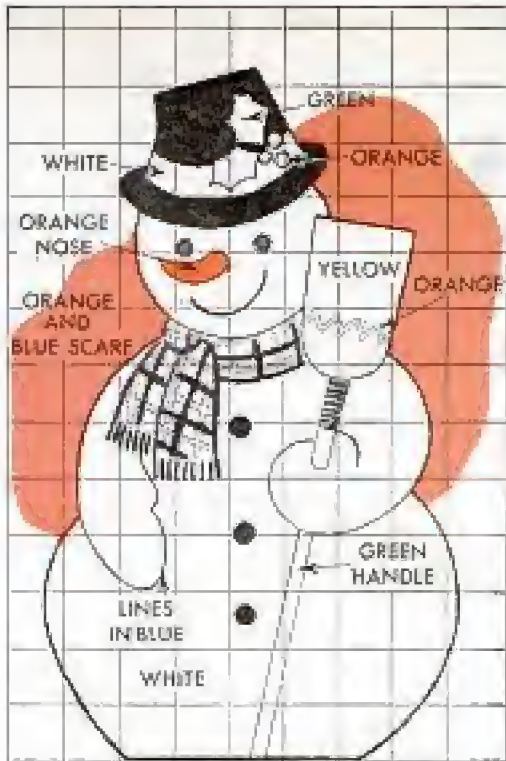
FOR AN EXTRA-SPECIAL Christmas display this year, train your outdoor spotlights on one or more of these cutout lawn figures. By following the plans prepared by the Douglas Fir Plywood Association, you will not only come up with some eye-catching outdoor decorations but you will truly enjoy making them. The eight designs presented in this story offer

a wide selection of displays and, if you and your neighbors usually cooperate on Christmas decorations, you can utilize the designs for an outstanding block display.

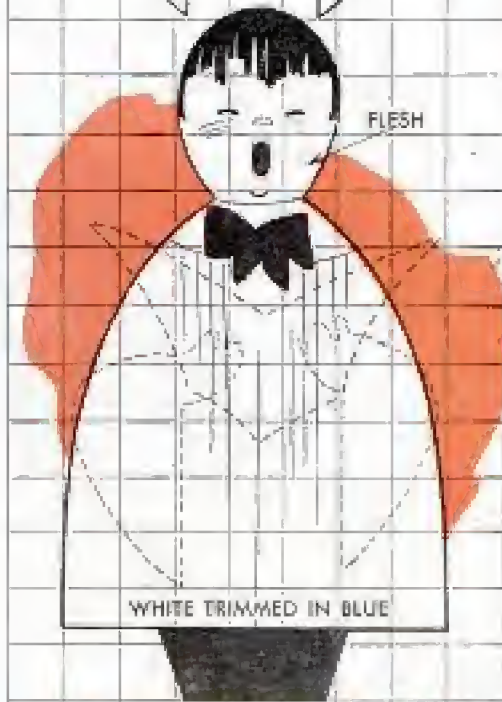
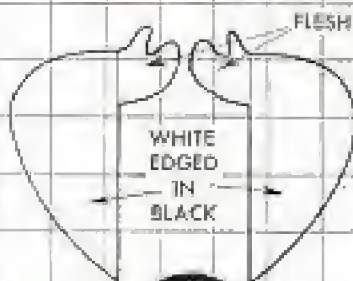
All of the designs are simple to cut out, the larger ones from $\frac{1}{2}$ -in. and the smaller ones from $\frac{3}{8}$ -in. exterior-grade fir plywood. If you want to decorate only one side of the cutout, the Plypanel-grading

The snowman cutout, upper left, may be used alone or in combination with the Christmas-tree cutouts. The carolers, upper right, or the choir boys, below, are excellent near the front door or under a window





SNOW MAN



CHOIRBOY



4" SQS.

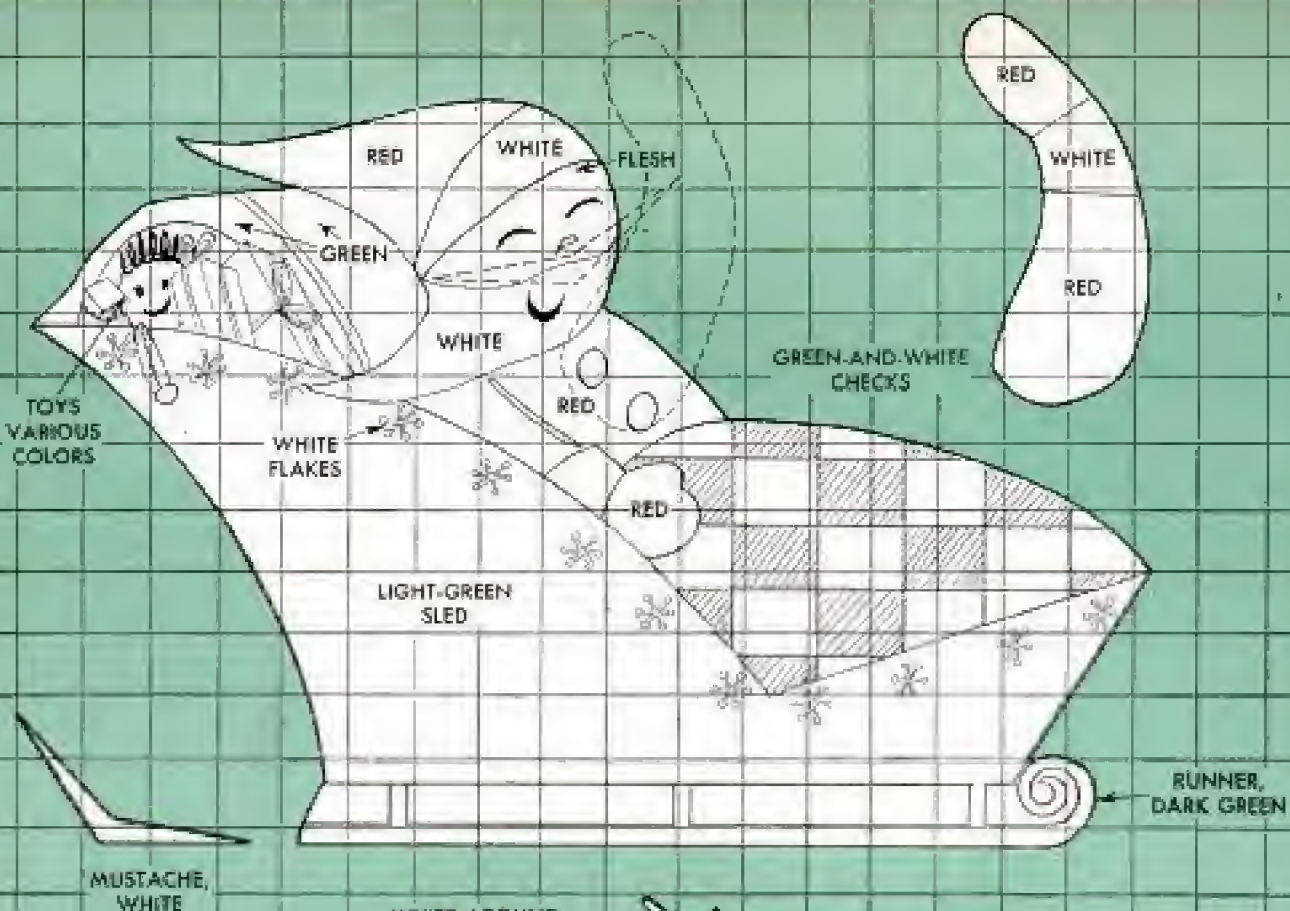


Here, Old Saint Nick and his trusty reindeer actually seem to prance across the roof tops to the delight of the youngsters



Christmas trees, above, are ideal for flanking the walk or front stoop. Lights can be added behind foam-plastic ornaments. Santa Claus, below, looks especially fine spotlighted on roof top

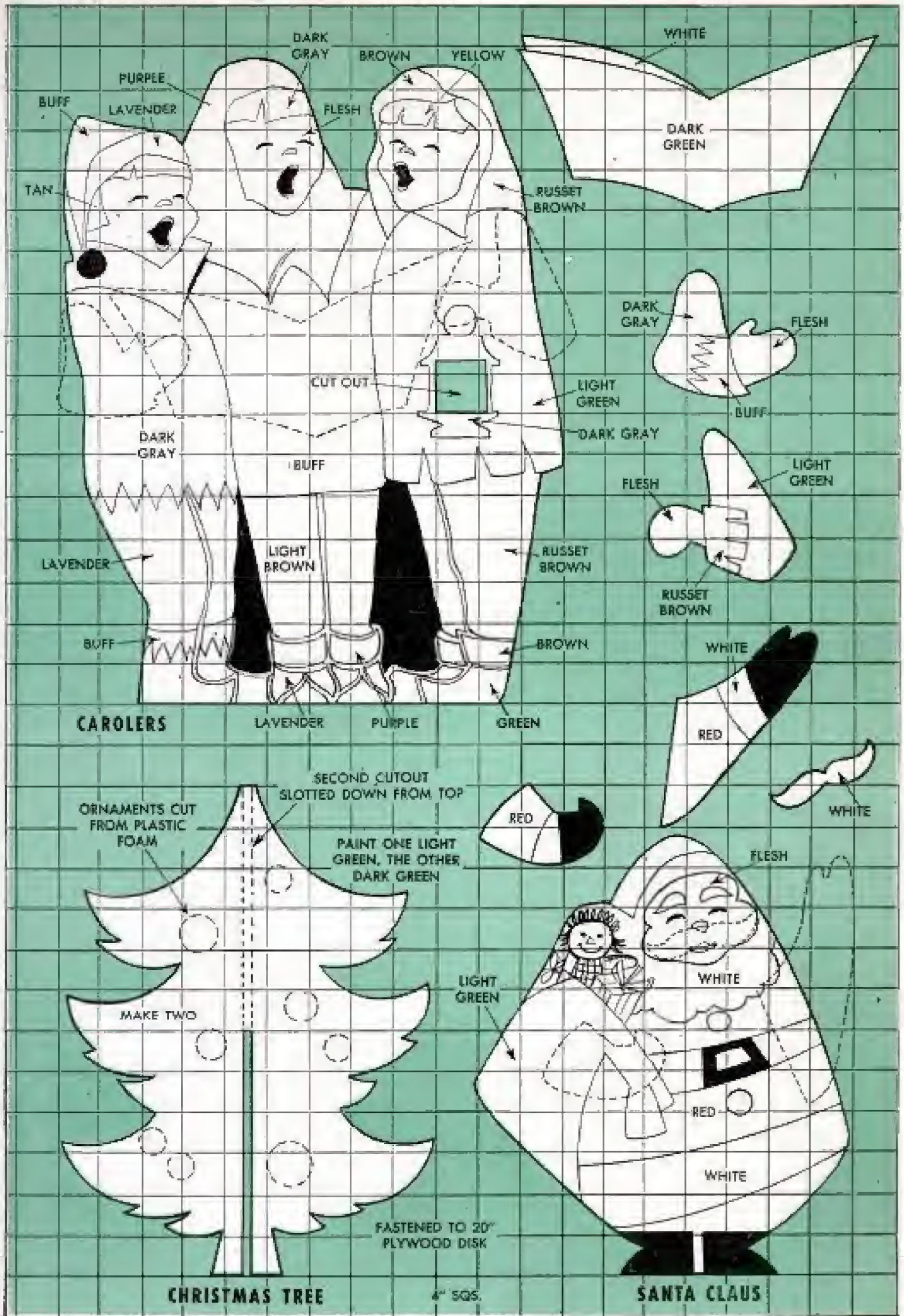




SLEIGH AND REINDEER

MAKE THREE OR MORE

2 3/4" SQS.



CAROLERS

LAVENDER PURPLE GREEN

ORNAMENTS CUT FROM PLASTIC FOAM

SECOND CUTOUT SLOTTED DOWN FROM TOP

PAINT ONE LIGHT GREEN, THE OTHER DARK GREEN

MAKE TWO

FASTENED TO 20" PLYWOOD DISK

CHRISTMAS TREE

4" SQS.

SANTA CLAUS

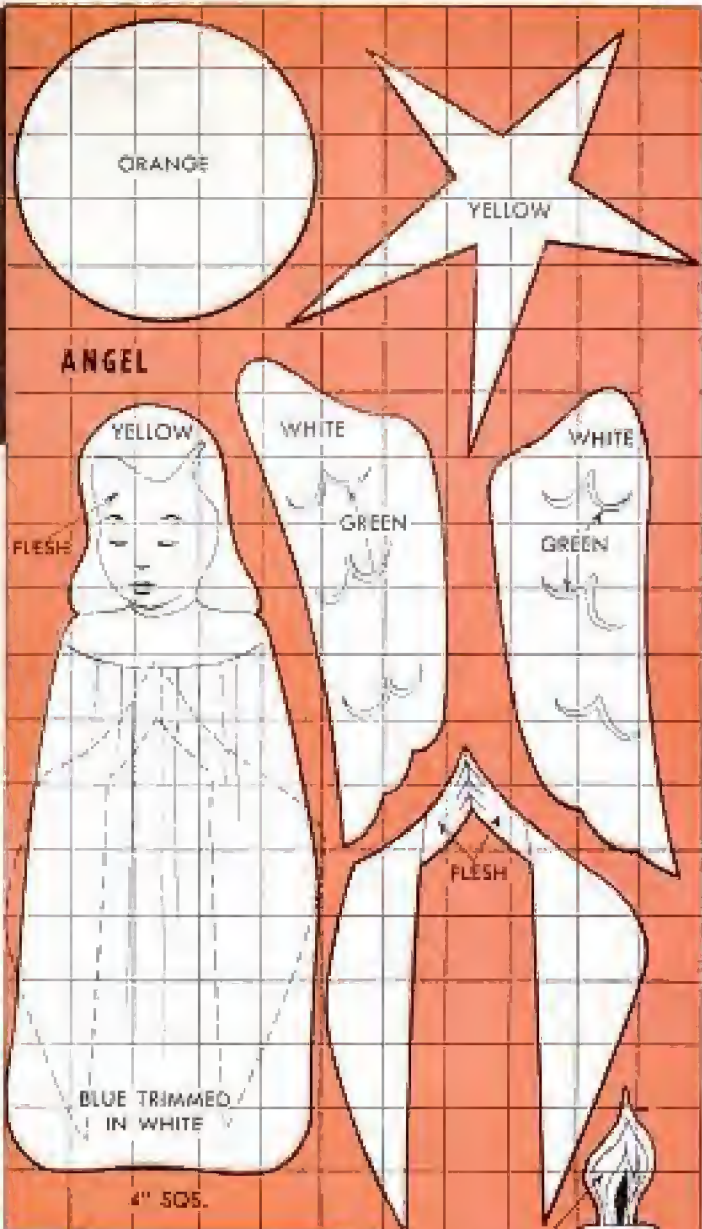


Pair of colorful candles, over 5 ft. tall, makes striking bay or picture-window decoration. They're fine, too, for sides of the doorway

plywood is the type suggested. This has one face of top-quality veneer, which would be used for the front of the cutout, and the other face of a lower-quality veneer. Should you prefer to decorate both sides of the cutout, obtain Exterior A-A plywood.

Enlarging the figures from the squared patterns and bandsawing them to shape is no problem. For best results in painting, fill in any gaps in the edges of the plywood with wood putty and then prime face, back and edges of the panels with exterior-enamel undercoat. Finally, add the exterior-enamel finish coat. ★ ★ ★

Some candles shown above are used with angel cutout in setup below. Either one or two candles and angel form attractive decoration



DOLLHOUSE TURNTABLE

By Stanley Roberts

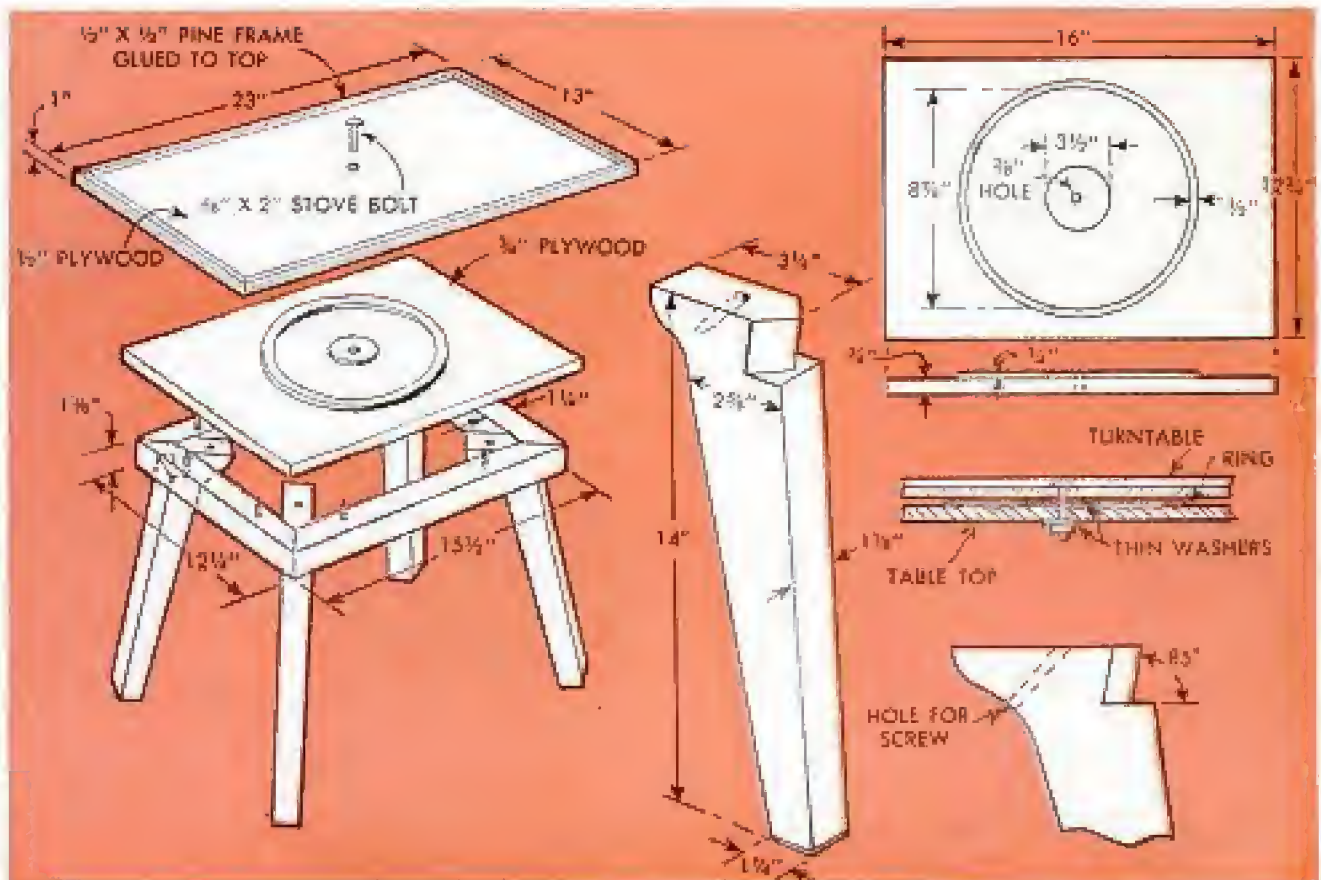
PLAYING with a dollhouse can be a lot more fun for a little girl if she has this turntable on which the house can be set. It's at the right height for play and can be turned as she likes without fear of scratching floors or a good table. Fir plywood is used for both the table top and the rotating turntable. The table top should be made from $\frac{3}{4}$ -in. plywood, while the turntable is best cut out of $\frac{1}{2}$ -in. material. Dimensions may be varied to suit the dollhouse. The frame is made of $1\frac{3}{8}$ -in. pine. Miter the corners as indicated in the detail and drill holes for the screws. Finally, assemble it with wood screws and glue.

The legs are cut from $1\frac{3}{8}$ -in. pine. Notch the top end to fit into the corners and to overlap the frame, as shown in the detail. Chamfer the bottoms of the legs so that they will not split while in use. Then join the legs to the underframe with wood screws and glue. The center disk and the bearing ring of the turntable are cut from



$\frac{1}{4}$ -in. birch plywood, and attached to the table top with glue and brads.

The turntable is framed with $\frac{1}{2}$ x $\frac{1}{2}$ -in. pine. The hole in the center of both the table and the turntable is $\frac{3}{8}$ in. counter-bored to take a $\frac{3}{8}$ x 2-in. stove bolt. To finish, paint all surfaces with dark-brown, semigloss oil paint. Coat the top surface of the center disk and the ring bearing with paraffin for smooth turning.

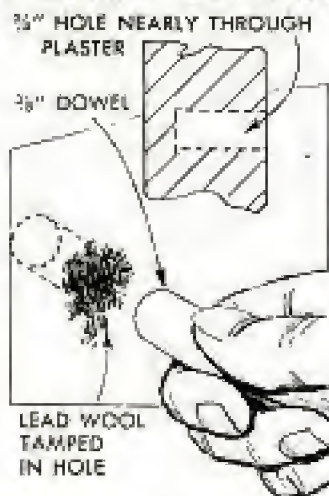




Counter Opening for Grocery Bags Permits Quick Filling

Filling large bags with groceries can be done much more quickly if the bags are at a lower level than the counter on which the groceries are piled. Instead of using an aisle-blocking bench or stool to hold the bags, cut out a section of the counter and build a platform beneath it. The size of the opening should be $8\frac{1}{2} \times 16\frac{1}{2}$ in., and the shelf should be 17 in. below the counter. The shelf and opening will accommodate a No. 50 paper bag. In stores where business is heavy enough, several of these counter openings might be used.

Wood Screws Hold in Plaster If Lead Wool Is Used



screw then can be driven into the lead, which expands uniformly against the plaster. Under normal use, the screw will not loosen or break the plaster.

Chemical Oxidation Is Retarded By Addition of Glass Marbles

The oxidation which occurs in some photographic chemicals can be retarded by using clean glass marbles to exhaust the air from the bottle in which the chemical is contained. The marbles are dropped into the bottle as the chemical is used, thus raising the level of the liquid and keeping the volume of the damaging air at a minimum. The marbles also could be used to raise the level of paint thinner in a bottle in which small brushes are cleaned.



George W. Crotts, Fayetteville, N. C.

Tape Holds Broken Parts Together When Mending Chinaware

Masking tape can be used to hold the broken pieces in alignment when mending chinaware because the tape will fit over any type contour, and can be removed later without leaving a mark. Rubber bands which, if used alone, would slip to a smaller section or force the parts out of line, can be used to apply pressure after the parts have been taped in position.

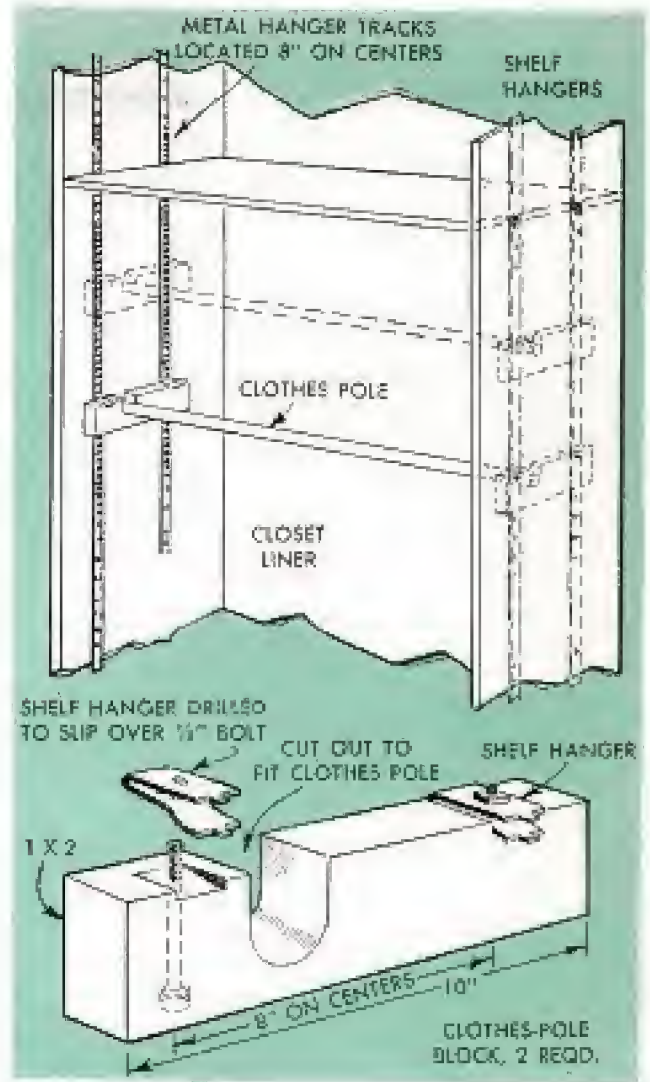


When working on a stucco or frame house, one workman avoids leaving ladder marks on the exterior walls by padding the upper ends of the ladder with several pairs of old woolen socks.

Here's a Closet That "Grows" With Your Children

If you provide your small fry with a clothes pole they can reach, you can teach them to hang up their clothes. And if the clothes pole in their closet can be adjusted, it can be raised as they sprout up—thus making a closet that "grows" right with them.

The adjustable feature is provided by the use of metal hanger tracks, such as are used in making adjustable bookshelves. One pair of tracks, spaced 8 in. on centers, is fastened to each side of the closet with $\frac{3}{4}$ -in. screws. It is best to have the tracks extend to within 10 in. of the ceiling. If you install shelves as well as a clothes pole, be sure the rear track is no more than 2 in. from the rear wall for a 12-in. shelf.



Economical Snow Fence Provided by Discarded Lettuce Crates

Properly placed, a snow fence will eliminate a lot of snow shoveling around garage and other exposed doorways, especially if winds have a tendency to drift even the slightest snowfall. The wire-bound sides of discarded lettuce crates can be used to

make an efficient and economical snow fence for this purpose. The ends of the crates are removed and the sides spread out and wired to stakes driven into the ground. The work of driving the stakes will be greatly simplified if the fence is installed before the ground freezes.

G. E. Hendrickson, Argyle, Wis.



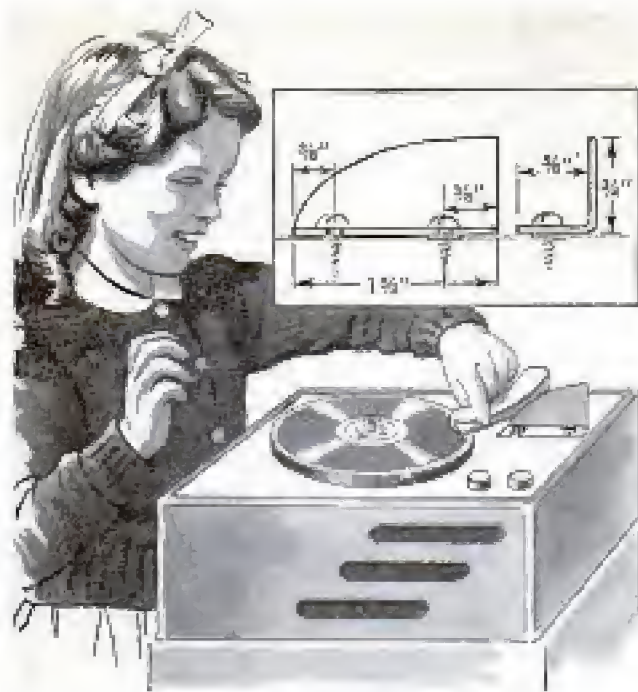
Holder for Hot Soldering Iron

When a regular holder for a soldering iron is not available, an emergency holder can be made by driving two nails into a block of wood or into the bench top. As shown in the photograph, the hot tip of the iron rests on the fork of the crossed nails and is clear of the workbench.



WTM 56

Circus-Wagon TOY CHEST

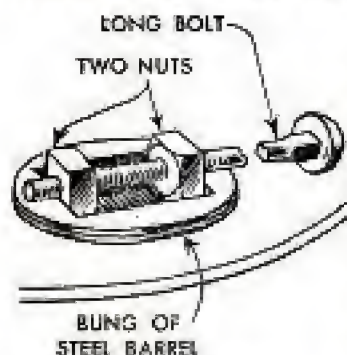


Bracket on Electric Phonograph Helps Child Place Arm

Although very young children can be taught to start a manually operated record player and to control speaker volume, they will have trouble locating the needle in the starting groove of the record. To overcome this problem, screw a curved sheet-metal bracket to the player so it will guide the tone arm to the starting groove. Cut and shape the bracket to the dimensions given in the detail above. Next locate the bracket by first placing the needle in the groove of a child's record. Then hold the bracket so it just touches the arm at a point well clear of the turntable. Mark and drill the two screw holes and use a washer under the one screw, as shown. This permits the bracket to swing out of the way when not in use.

Basil Jackson, Toronto, Ontario, Can.

Barrel-Bung Wrench Improvised From Bolt and Nuts



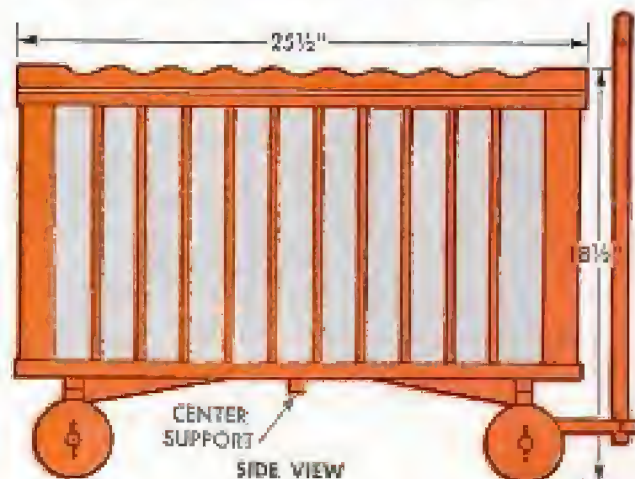
If a wrench is not available, the bung of a steel barrel can be opened by using a $\frac{1}{2}$ -in. or $\frac{3}{8}$ -in. bolt about 10 in. long, and two square nuts to fit. Turn the nuts onto the bolt and space them to fit snugly

inside the recessed surface of the bung. Hold the nuts down with a block of wood while applying turning pressure.

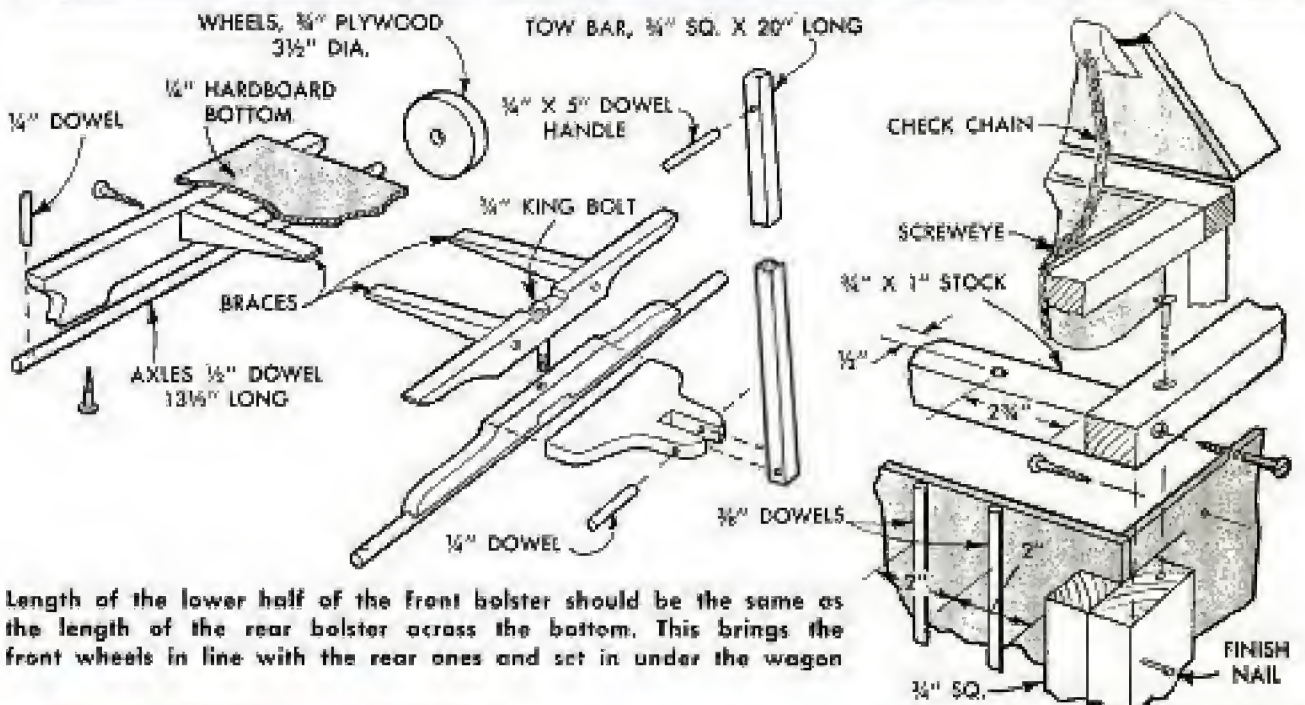
RESEMBLING A TOY itself, this novel toy box on wheels can be pulled along like a wagon when picking up after busy small fry. Its lively circus motif will add a colorful touch to any nursery. The "cage" can be made to look even more realistic by applying an animal decal to the side panel behind the dowel bars. The scrolled roof of the wagon is hinged along one side.

Start by assembling two $14\frac{1}{2} \times 25\frac{1}{2}$ -in. frames from $\frac{3}{4} \times 1$ -in. white pine. These provide the top and bottom members of the box itself. The underside of the bottom frame is covered with $\frac{1}{4}$ -in. hardboard, flush with the outside edges. Registering holes for the $\frac{3}{8}$ -in. dowels that are placed across the front of the wagon, are bored by clamping the two frames together and drilling both at one time. The holes are spaced 2 in. apart and are centered on a line $\frac{1}{2}$ in. from the front edge. The frames are joined at the corners with built-up posts, $12\frac{3}{4}$ in. long. Each one consists of two pieces of white pine, one measuring $\frac{3}{4} \times 1\frac{1}{2}$ in. and the other $\frac{3}{4} \times \frac{3}{4}$ in. The two are nailed together to form an angle and, when installed, they provide an inside nailing surface for the hardboard side and end panels. The posts are set in $\frac{1}{4}$ in. at the corners to bring them flush with the inside edges of the two frames.

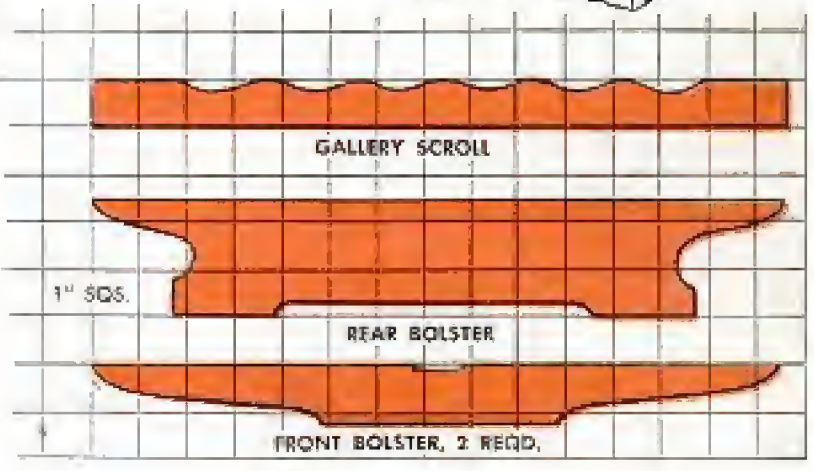
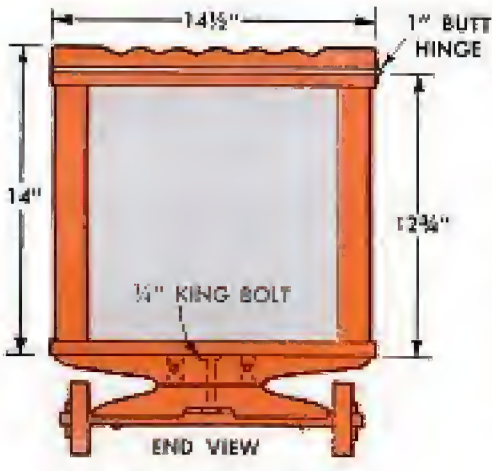
Bolsters for the front and rear axles are cut from $\frac{3}{4}$ -in. pine according to the squared drawing and fastened to the underside of the wagon box with screws driven through the hardboard bottom. Hardwood dowels provide axles for the $3\frac{1}{2}$ -in. wooden wheels which are cross-pinned to the axles with short $\frac{1}{2}$ -in. dowels. The drawing of the under-carriage assembly shows how the handle is attached to the lower half of the front bolster ★ ★ ★



POPULAR MECHANICS



Length of the lower half of the front bolster should be the same as the length of the rear bolster across the bottom. This brings the front wheels in line with the rear ones and set in under the wagon



Paper-Tape Roll Hung on Belt Frees Hands for Applying It

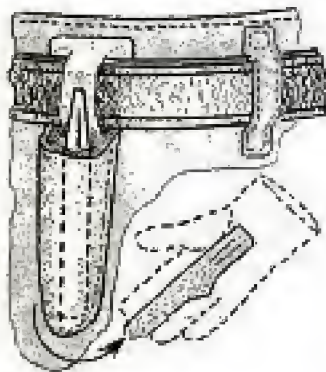
See
1271-6



Keeping both hands free when applying tape to plasterboard joints can be done by hanging the roll of tape from your belt. Slip the roll onto a loop of light wire or heavy cord and tie it to your belt. Make the loop loose enough so the tape can be pulled easily from the roll as it is applied. This same stunt also can be applied to rolls of friction and rubber tape used on wiring.

Stanley J. Pollard, Georgetown, La.

Finger of Leather Glove Provides Nail-Set Pocket



The problem of fishing among the nails in a nail apron to find a nail set can be overcome by making a pocket to carry it on a belt. The finger and part of the back of a glove are cut, as shown, and the back is slit to form a loop.

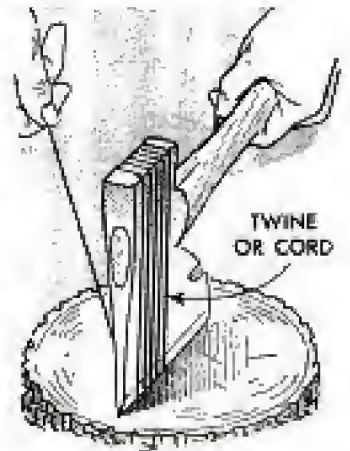
Soft Print Made From Negative Which Has Too Much Contrast

If a negative has too much contrast when printed on even the softest paper, there is a method that can be used to provide a softer print without reducing the negative. First, make a print in the usual way on

the softest paper available. Next, immerse the print in a solution of one percent potassium bichromate for about one minute. Agitate the print thoroughly, remove it from the solution and wash off all traces of the bichromate with water. Then put the print in the developer and develop in the usual way. It will be necessary to adjust the exposure time to obtain the desired results and, of course, all the work should be done in the darkroom under safelights.

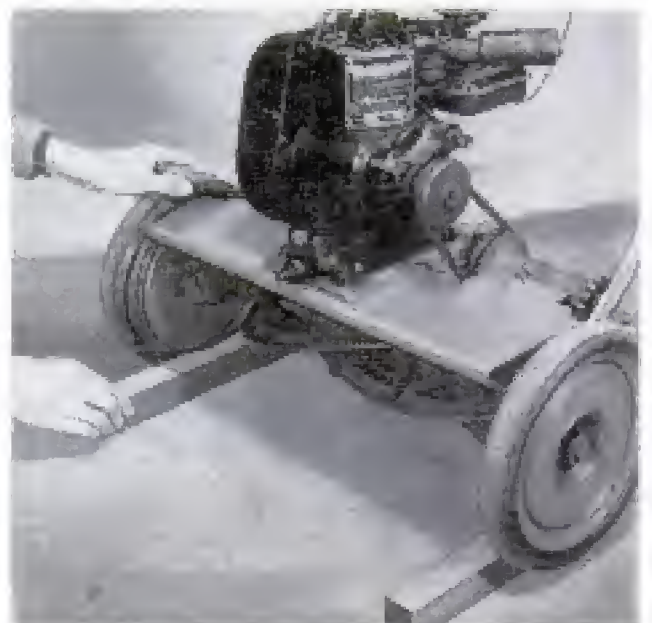
Twine Is Cut in Equal Lengths When Wrapped Around Ax

When a number of pieces of twine of the same length are needed, such as when tying feed sacks, an ax or hatchet may be used to cut them. The required number of turns are made on the ax head, and a quick blow on the edge cuts the twine.



Blocks Under Stored Lawn Mower Prevent Damage to Tires

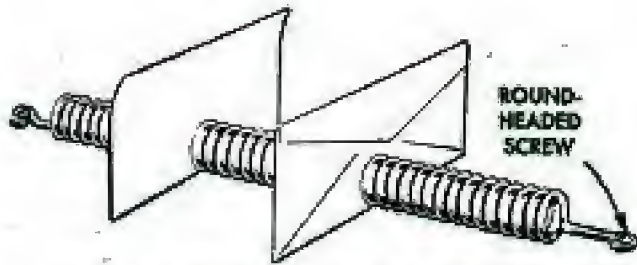
Two blocks of wood, placed under the axle of a power lawn mower when it is stored for the winter, will prevent the rubber tires from becoming flattened in one spot by the weight of the machine. Also, the blocks will keep the tires clear of oil or dampness on the garage or basement floor which could cause the rubber to deteriorate.—R. Hanscom, Elmhurst, Ill.



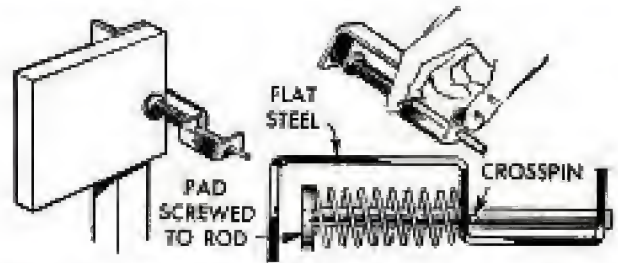
Stunts with SPRINGS

By Sidney V. Worth

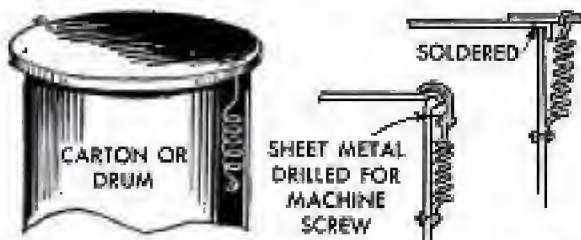
ALTHOUGH not often considered as being useful to the home craftsman, coil springs—both tension and compression—can be used in countless ways around the home and workshop. One source of supply is the springs used to close screen and storm doors. They come in a number of types and sizes and, when broken, usually are discarded. Properly utilized, they still may have a long and useful life. Shown on this page are a few examples of the many ways the springs can be used.



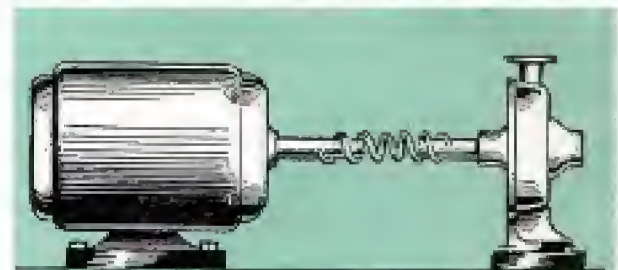
Form eyes in both ends of a length of coil spring, stretch it slightly and fasten to the bench top with round-headed wood screws. Cards, letters and other papers are held by coils



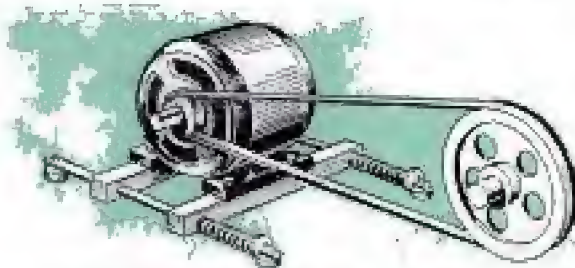
A handy tension clamp for holding light work is made by bending flat steel to a squared-S shape, drilling it to receive a length of rod fitted with pad. A crosspin in the rod provides a fingerhold for opening clamp



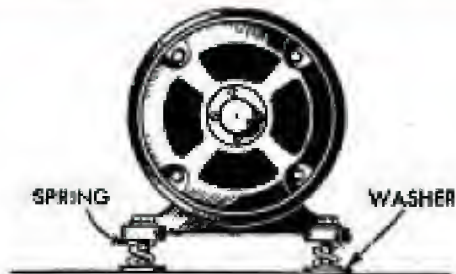
The lids on cartons, drums and garbage cans will be held on tightly if springs are used in one of the three ways shown in detail above. Place the springs under just enough tension to hold the lids firmly



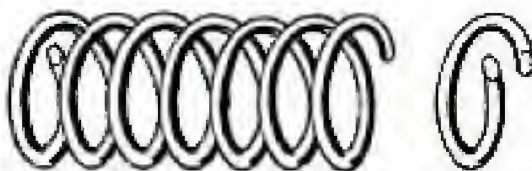
A temporary shock-absorbing coupling between electric motor and pump or other machine can be made from heavy spring of same or slightly smaller diameter than the shafts



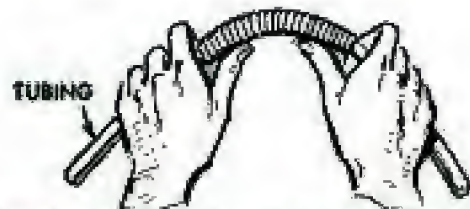
Compression springs provide constant tension on belt between motor and pulley. Simple mount consists of lengths of wood to which motor is bolted. Mount slides on two rods



Springs under electric motor assure quiet, vibration-free running. Adjusting length of each bolt against spring tension provides means of aligning shafts



Next time you can't find a lock washer of a particular size, look through your stock of coil springs. Cut the coils so ends overlap, then file to meet smoothly as do regular lock washers. The spring should be a fairly stiff compression type, although in an emergency a tension spring can be stretched and cut



Bending tubing without kinking can be done by using a length of coil spring that fits snugly over tubing. Center the spring on point of bend, shape with thumbs placed as shown

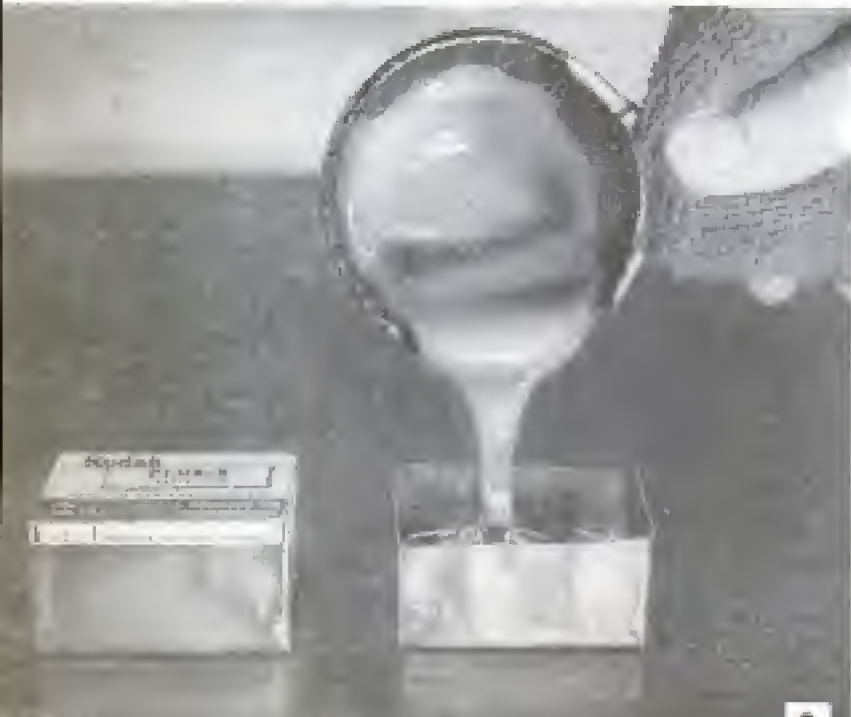
W T M 56

Cutlery handles you can make

By Lee Woods



Pattern for plastic-inlay design is traced on soap-rubber eraser and cut out, as above. Sides of cutout pattern must be perpendicular. Below, pattern is placed in bottom of aluminum-foil trough and rubber-mold material is poured over it



DRESSING UP your sporting knives and fine kitchen cutlery with custom-designed plastic handles is easy, and the results are sure to bring the admiration of your friends. These serviceable handles can be made as fancy as you like, as the molded plastic permits an endless selection of colors and patterns.

To make the handles, you'll need liquid casting plastic and catalyst, dye of the desired color, one or more soap-rubber erasers and some rubber-mold compound. The other items, like aluminum foil, razor blade and masking tape, you'll probably have around the house.

The first step is to cover the blade and metal tip of the handle, if any, with masking tape. Then remove the old handle from the blade, cutting or sawing as necessary but being especially careful not to mar metal surfaces that will be exposed when the work is finished.

Making the patterns for the inlays comes next. Be sure to keep the inlay small enough so that it will be at least 1/8 in. from the sides of the finished handle when installed. Then trace or draw the design of the inlay on a soap-rubber eraser, using a pencil first and then going over the pattern with drawing ink. Then cut out the pattern, Fig. 1, with a single-edge razor blade or a coping-saw blade,

being careful to keep the sides of the pattern perpendicular to the face. Cementing strips of fine sandpaper to the sides of toothpicks will give you a supply of tiny cutting tools for the hard-to-reach corners of the eraser pattern.

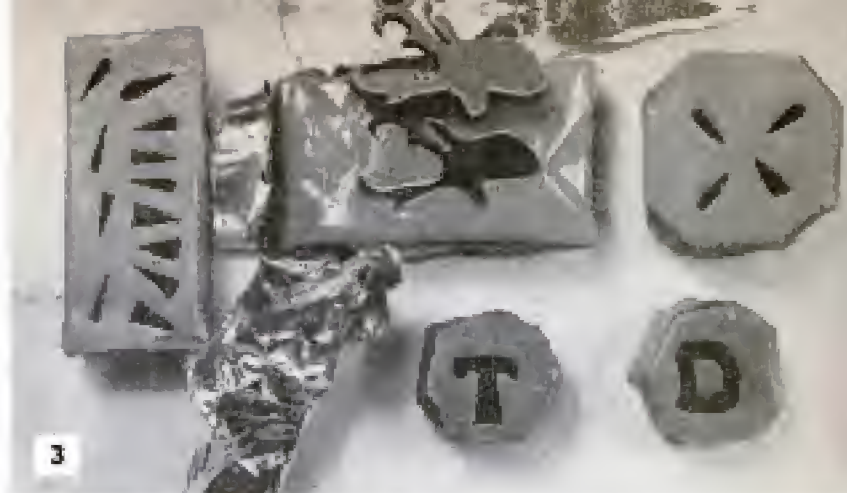
Then make a trough from aluminum foil. This should be large enough to allow $\frac{1}{4}$ to $\frac{1}{2}$ in. of rubber-mold material to be poured over the top of the pattern and $\frac{1}{2}$ in. of the material on all sides. Place the pattern in the bottom of the trough, heat the rubber-mold material and pour it over the pattern, Fig. 2. After allowing the mold to cool, remove the foil and take the eraser pattern out of the mold. Fig. 3 shows several rubber molds ready for use.

Now mix the liquid plastic. As procedure will vary slightly depending on the manufacturer of the material, follow his directions carefully when adding the catalyst and dye. Stir the plastic slowly to avoid air bubbles and allow any bubbles that may form to rise to the surface before pouring. Then pour the mixed plastic slowly into the mold, Fig. 4. If the plastic requires heat-hardening, be careful not to overheat it, as overheating is likely to cause the casting to crack. Should the mold become too hot, place it immediately in the refrigerator or in a shallow pan of cold water. Castings weighing 2 oz. or more should be allowed to stand overnight at room temperature before heating.

When the casting has cooled and hardened, remove it from the mold. Then clean the mold and cast a duplicate inlay so you will have one for each side of the handle.

When the inlay pieces have hardened, arrange them on the knife-handle tang and cement in place as in Fig. 5. Then allow the cement to dry thoroughly. Make a second aluminum-foil trough which will accommodate the entire handle, as pictured in Fig. 6. The trough should be $\frac{1}{4}$ in. larger all around than the size of the finished handle. This eliminates depressions in the finished handle which otherwise might be caused by bubbles forming near the foil mold.

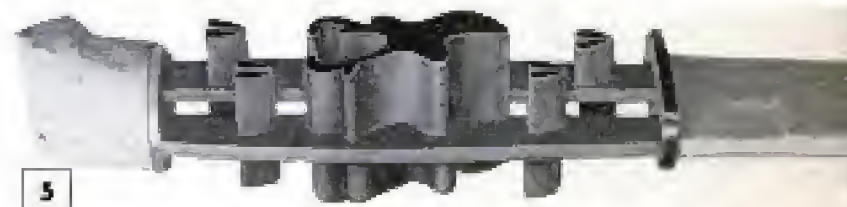
Place the handle tang with inlays — or without inlays if the handle is to be plain — in the



When material has cooled, remove foil trough and eraser pattern from rubber mold. Note various mold designs shown above



Liquid-plastic solution is mixed with catalyst and dye and then poured slowly into rubber mold, above. After hardening and cooling, inlays are cemented to handle tang, below



A second aluminum-foil trough is made, this time to enclose the entire knife handle. Holes and joints of trough must be sealed carefully and plastic poured in slowly, as shown below





Plastic handle is a crude block when foil is removed from it. This is roughed to shape with wood rasp or coarse sandpaper



Roughly shaped handle is given a secondary sanding with 180-grit paper and then a final sanding with 320-grit paper, as above, both sandpapers being used wet. After sanding has resulted in desired shape, handle is given final polishing with cloth



trough. Seal off all holes in the trough with cellulose tape and cement joints of the trough, as it is important that the trough be leakproof when the plastic is poured into it.

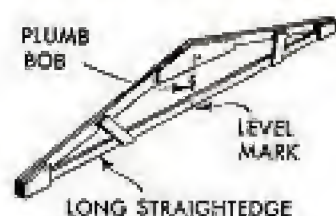
Check to see that the foil trough has not been dented to the point where it will leave an impression in the plastic. Then mix the plastic and pour it slowly into the trough as shown in Fig. 6. The plastic should cover the handle tang to a depth of $\frac{1}{4}$ in. over its top. This plastic, of course, will be of a contrasting color to that used for the inlays.

The hardening of the handle casting is considerably more critical than that of the inlays. After the plastic has jelled, it is best to leave it at room temperature overnight before heating. Then be careful that you do not heat the casting excessively. When the plastic has hardened and cooled, remove the foil trough.

The handle at this point is a rough plastic casting. Begin working it to shape with a wood rasp, Fig. 7, or coarse sandpaper. When the handle is slightly larger than finished size, begin smoothing the surface with 180-grit wet sandpaper. Then follow with a finer, 320-grit wet paper, as in Fig. 8. Give the handle a final polishing with a soft cloth. When the masking tape is removed from the blade and handle tip, your knife handle will look much like the one pictured in Fig. 9, and it will be as rugged and durable as it is good looking.

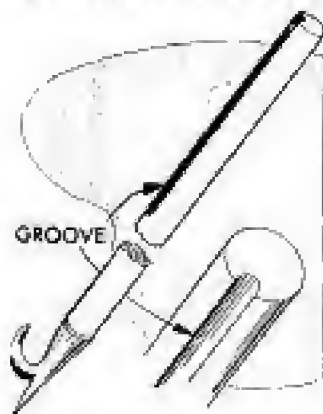
If an air bubble should leave a depression in the plastic surface that can't be sanded out, you can patch it with plastic of a matching color. Sand with 320-grit wet sandpaper and polish to blend in the patch with the rest of the handle. ★ ★ ★

Plumb Bob on Long Straightedge Permits Use As Level



An exceptionally long straightedge, which is cross braced to assure that the edge remains accurate, can also be utilized as a level. A plumb bob is suspended from the center of the cross brace, the straightedge is set level and the location of the plumb is marked on the straightedge. In use thereafter, locating the plumb on the mark will show when the straightedge is level.

Handle of Boat Hook Grooved To Indicate Hook Position



In order to tell which way the hook end of a long-handled boat hook or gaff is facing when you use it in deep water or at night, cut a shallow groove along the handle on the same side as the hook. Then, when using the hook, you can tell which way it is facing by the feel of the handle in the palm of your hand.

J. H. Muscat, Saint Julians Bay, Malta.

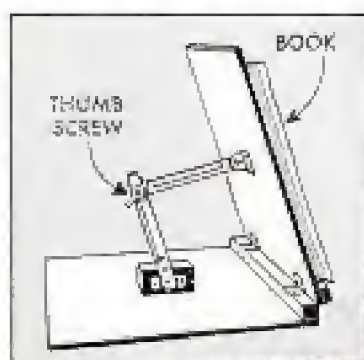


Magnifying Glass Held Steady By Simple Wooden Standard

When a magnifying glass is used for long periods of time, a simple wooden standard may be used to hold the glass steady and at the right distance from the surface being examined. The standard is a length of broomstick fitted in a hole drilled in a plywood base. The magnifying glass is moved up and down the broomstick until the focal point is determined, then a hole is drilled in the broomstick to receive the handle of the glass. The plywood base is cut out, as shown in the photograph, so the work to be examined is exposed.

Adjustable Plywood Bookholder Ideal Gift for Bedridden

This adjustable bookholder, which makes an ideal gift for a bedridden friend or anyone who likes to read in bed, is an easy one-evening project. The two leaves of the holder are $\frac{1}{4}$ -in. plywood, 10 x 12 in., with a $\frac{3}{4}$ x 1-in. strip fastened to the long side of one piece. A pair of $1\frac{1}{4}$ -in. butt hinges is mounted on the strip, being mortised so that the folded hinge is flush with the surface. The hinges are then attached to the other leaf of the bookholder with wood screws that go through the plywood and into a narrow strip that forms a ledge for the book. The edge on which the book rests is a $\frac{1}{2}$ x $\frac{3}{4}$ -in. strip. The adjustable bracket is the type used on storm sash, a thumbnut



being provided in place of the hex nut for tightening. The lower end of the bracket is fastened to a $\frac{1}{2}$ x $\frac{3}{4}$ x $2\frac{1}{2}$ -in. block of wood, which is screwed to the base leaf of the holder.—John Strickler, Detroit, Mich.



INDOOR SHOOTING GALLERY

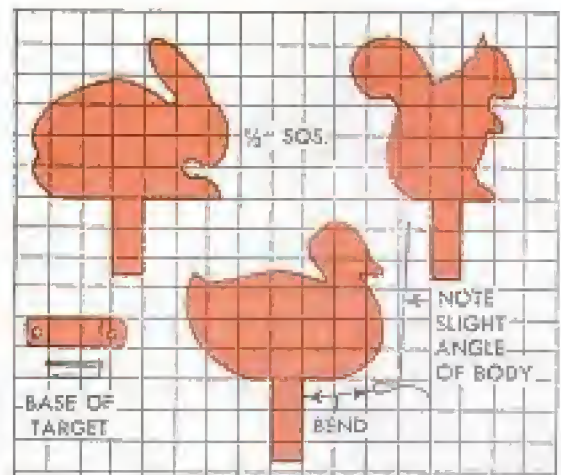
By Webster P. Taylor

THAT YOUNG SPORTSMAN in your home can practice his air-rifle marksmanship safely if you install a shooting gallery like this one in your basement. It has both still and moving targets just like the large ones at penny arcades.

The frame is made of $\frac{3}{4}$ -in.-sq. stock, the beds for the moving and stationary targets are hardboard and the backstops are heavy-gauge sheet metal. The drums which turn the belt carrying the moving targets are beverage cans, the ends of which are center drilled so the cans turn freely on $\frac{1}{4}$ or $\frac{3}{8}$ -in. axles. The belt is driven by a small electric motor hooked to a gear reducer taken from a toy construction set. The reducer is fitted with a

flat pulley which drives one drum through a flat belt. Fine sandpaper is cemented to the drums to provide a grip for the leather or canvas belt. The bases of the moving targets are riveted to the belt, and each target is bent slightly forward so that vibration and the movement of the belt will not tip it back. The coat-hanger-wire loop which straightens the targets as they pass around the drum, will require some adjusting to do its job properly.

The lights and buzzer are operated from an electric-train transformer; the lights are regular Christmas-tree lights wired in parallel. Drops of solder added to the counterweights of the swinging targets adjusts them to tip with slight pressure. ★ ★ ★



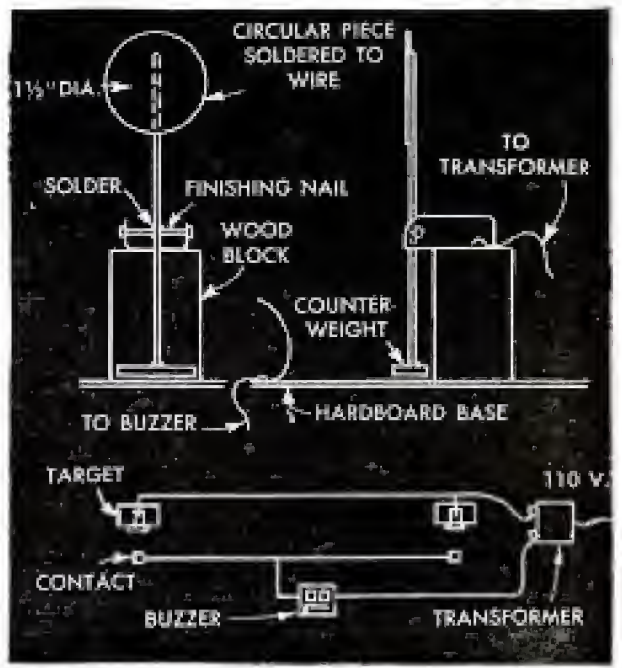
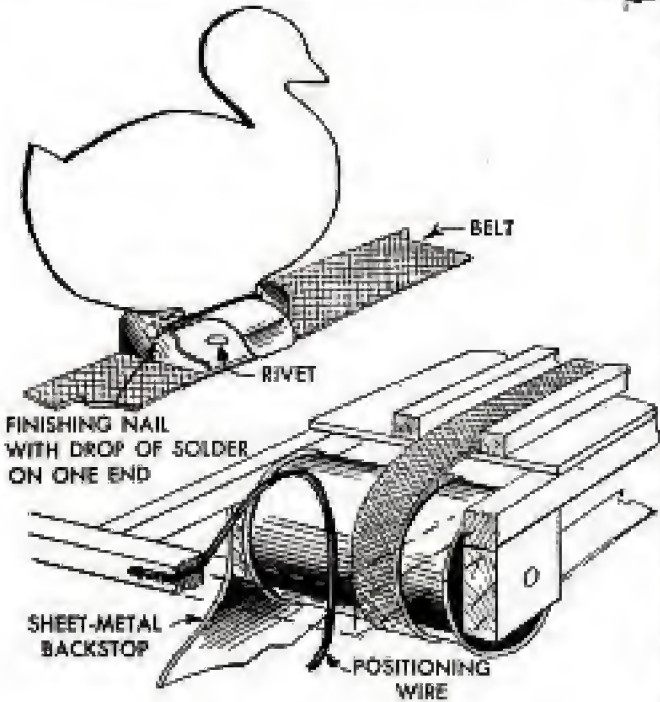
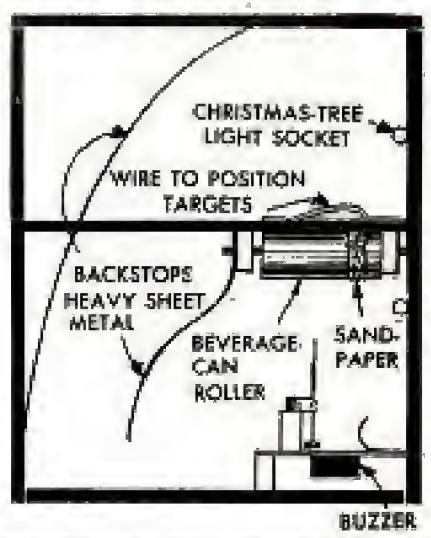
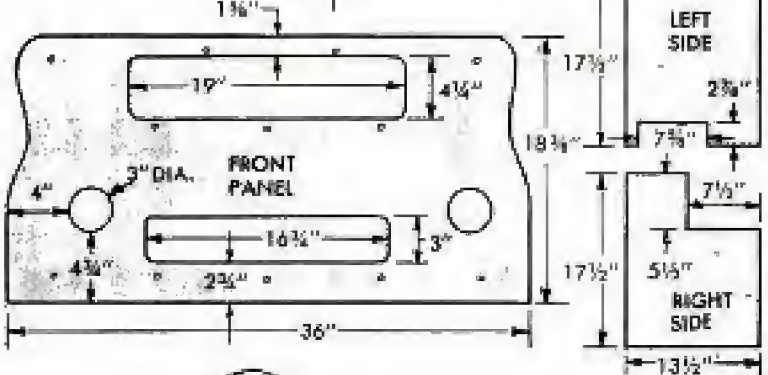
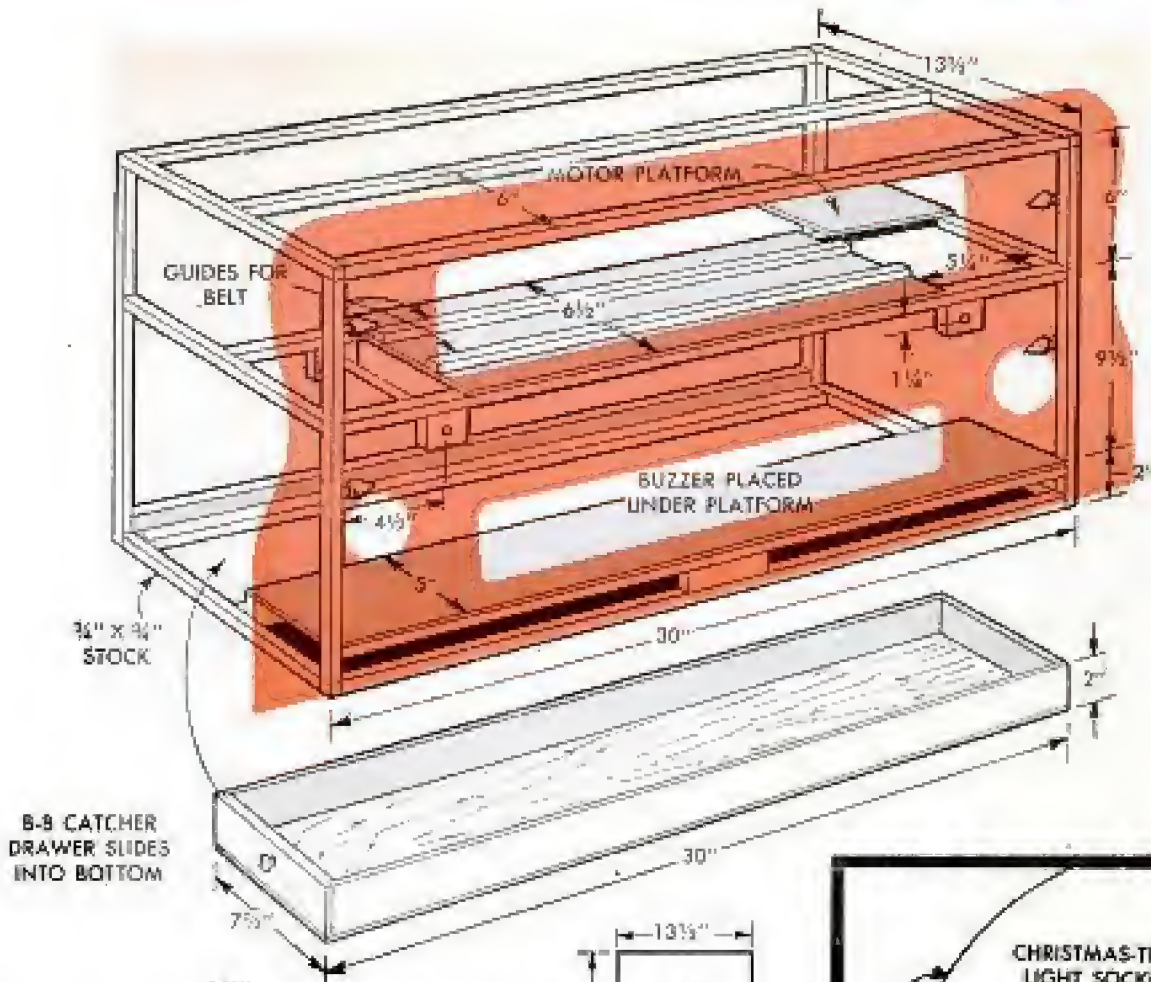


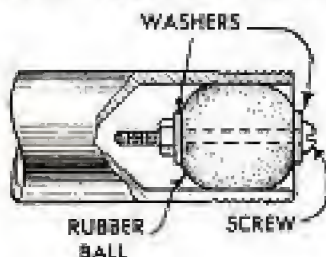
Photo-Negative Brush Kept Soft By Natural Skin Oils



A soft camel's-hair brush, which is ideal for removing dust from negatives, will dry out in time and shed bristles onto the film. To prevent this, occasionally wipe the brush across your forehead to absorb some of the natural skin oils from your face. The oil is so fine that it will leave no marks on the negative to be picked up in printing. To clean the brush when it becomes dirty, wash it gently in a coconut-oil hair shampoo. When it is dry, reapply skin oil from your forehead.

Robert C. Florian, Chicago.

Stopper for Open Water Pipe Improvised From Rubber Ball



If you keep two or three solid-rubber balls of different sizes in your toolbox, a stopper for an unfinished water line can be improvised if you do not have pipe fittings at hand to close the pipe. A hole to receive a screw is drilled through each ball by using a sharp-edged metal tube lubricated with water. A washer is fitted under the head of the screw and under the nut so that when the screw is tightened the ball will expand inside the pipe. The ball should be just slightly smaller than the inside diameter of the pipe in which it is used.

Detecting Leak in Sewer Pipe

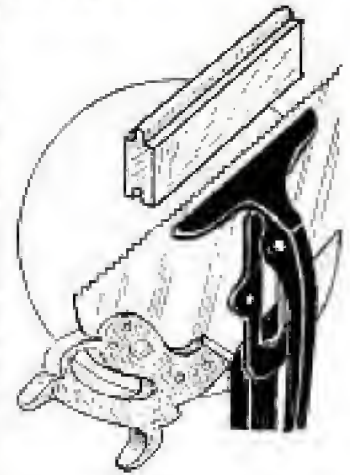
During a long dry spell it sometimes is possible to tell whether or not there is a leak in an outdoor water pipe or sewer by

inspecting the ground above the pipe. Grass or flowers directly above the leak will appear fresh and green in contrast to the brownish, faded appearance of the rest of the lawn and garden.

Ted Otsu, Vancouver, B. C., Can.

Length of Flooring Provides Gauge When Sharpening Saw

A short length of tongue-and-groove flooring can be used to provide a gauge for setting a handsaw at a uniform depth in a vise. With the teeth of the blade projecting the same amount for the full length of the blade it is easier to file the teeth to a uniform depth and angle. In use, the strip of flooring is placed over the blade, groove side down, and the blade is lowered into the vise until the wood just contacts the jaws.



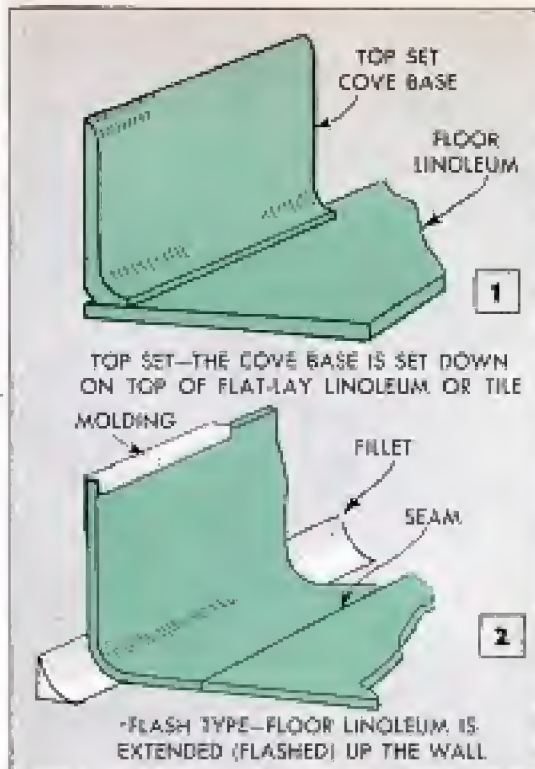
Nails Used on Print Rollers Replaced With Wood Screws

The short nails which are used as axles or spindles on some print rollers become loosened after a comparatively short period of use. To correct this, remove the nails and replace them with screws driven into the roller in their place. Use screws of a size that fit loosely in the holes in the handle, so that the roller turns freely. Avoid oiling the spindles as any excess oil is likely to soil the prints.

O. A. Nelson, Seattle, Wash.



POPULAR MECHANICS



Lay Your Own LINOLEUM COVE BASE

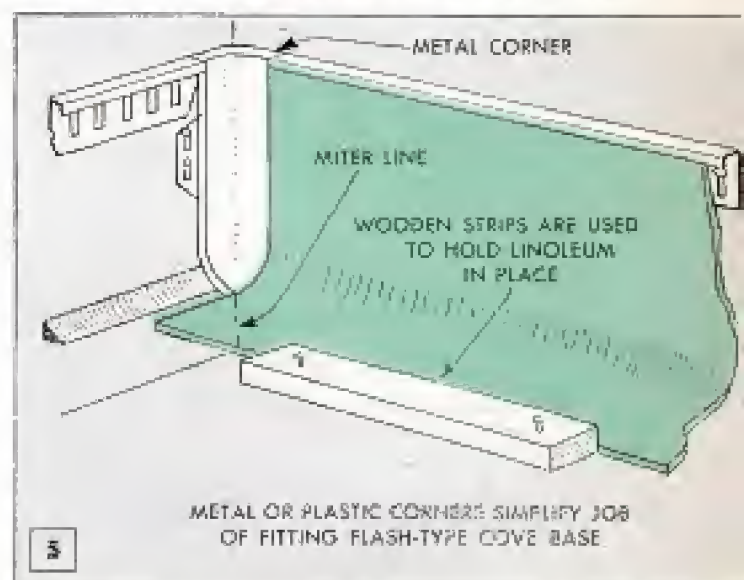
By Sam Brown

EXTREMELY NEAT and colorful, the cove-base linoleum floor has the added advantage of forming a smooth, easily cleaned joint between floor and walls, an especially desirable feature in kitchens, laundry and utility rooms. Although the simplest installation is top set, Fig. 1, the true cove base is the style in which the floor material is extended (flushed) up the wall. Flashed cove base can be installed in a variety of decorative schemes, the plainest design being the same color and pattern as the floor material, Fig. 3. More often, the cove base is a solid color repeating the predominant shade of the floor pattern. A distinctive separation line between the cove base and the floor (or field) linoleum often is provided by using a feature strip, Fig. 14, of a contrasting color.

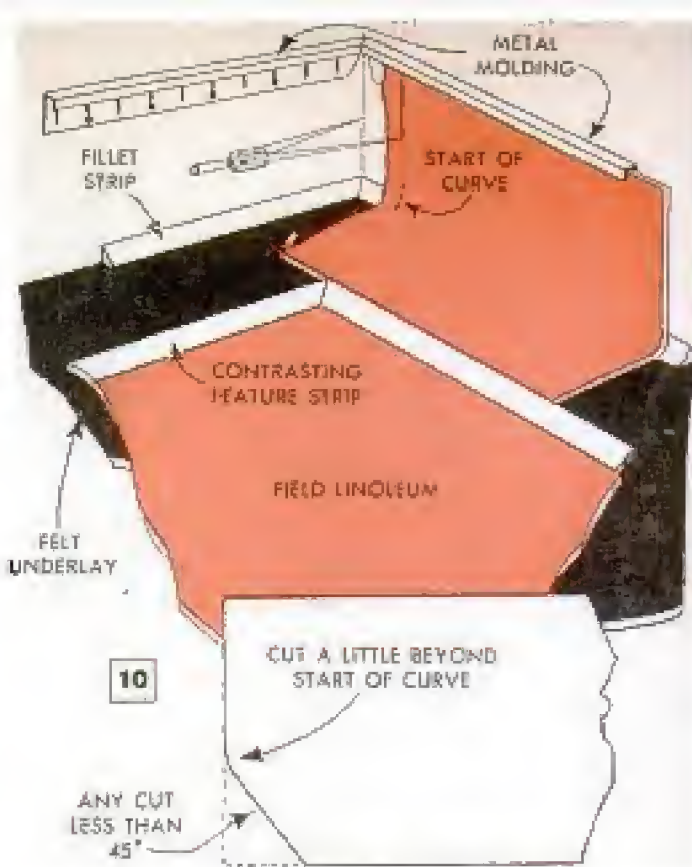
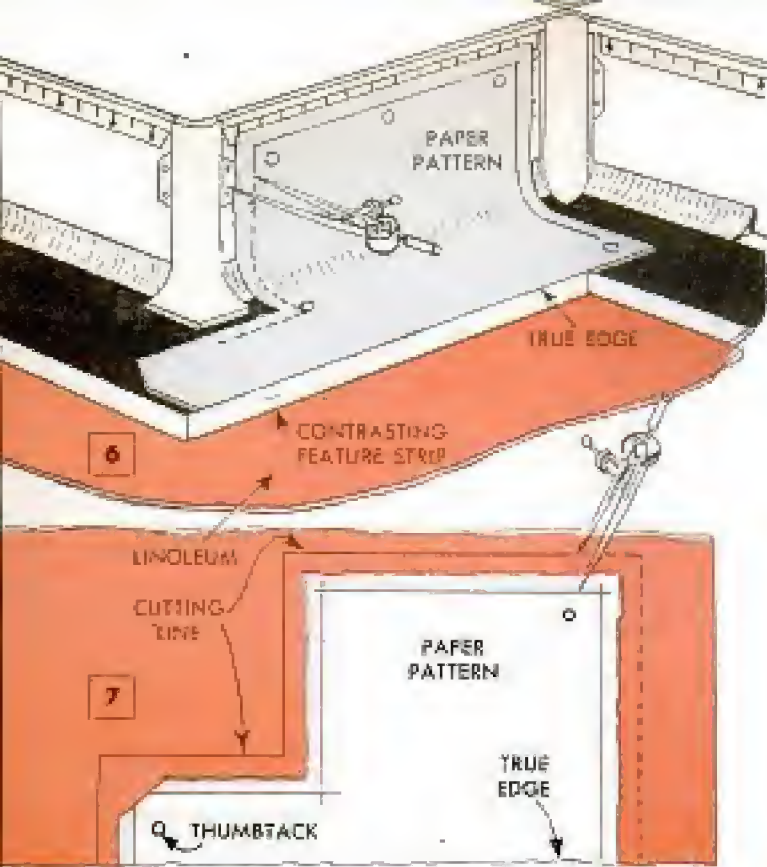
Fittings: Two essential items for flashed cove base are the cap molding and the fillet. The cap molding is a metal or plastic shape which provides a trim and stop on the top edge of the cove, and is nailed 4 to 6 in. above the floor. The fillet is a cove molding, Fig. 2, which is available in plastic



Above, simplest installation of cove base uses same color and pattern of linoleum as the floor, or field



Figs. 4 and 5 show method of using metal or plastic inside and outside corners to fit flash-type cove base

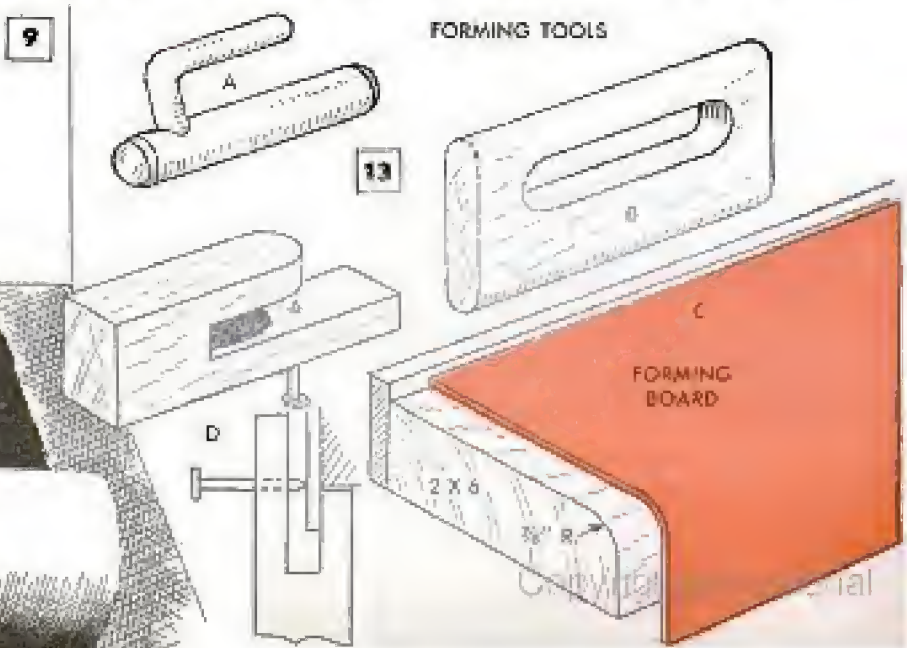


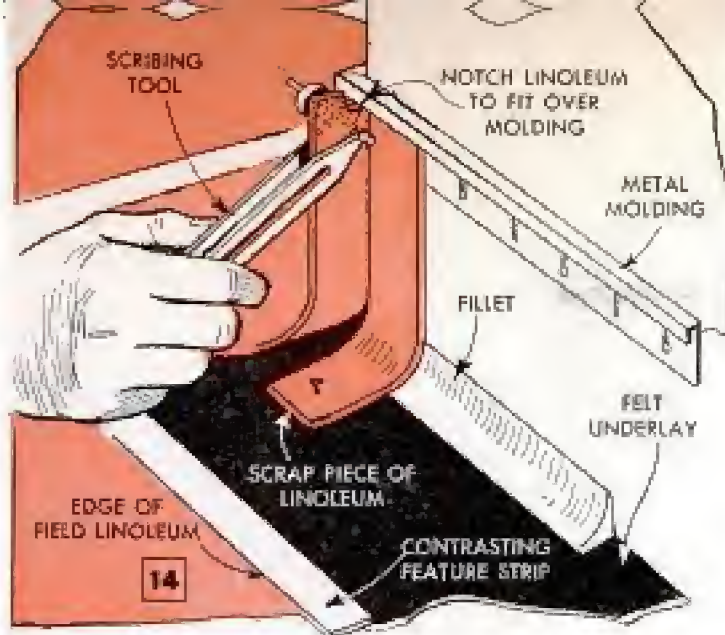
Figs. 11 and 12 show how an inside corner is cut and fitted when metal or plastic corners are not used



Above, when patterns are used to cut cove, allowance must be made for fitting under cap molding and corners

Below are shown tools that can be purchased or made which aid fitting and shaping cove base in corners





and other flexible materials. It is nailed or cemented in the corner between wall and floor over the usual felt underlay. Ordinary wood-cove molding, $\frac{3}{8}$ in. on the sides and with a $\frac{3}{8}$ -in. radius also can be used. Other fittings which may be used if desired, are outside and inside corners, Fig. 4, and right and left-hand end stops. They are available in either metal or plastic, $4\frac{1}{2}$ or 6 in. high. In all cases, when installing cove-base floor, the conventional wood baseboard and base shoe, if present, are removed.

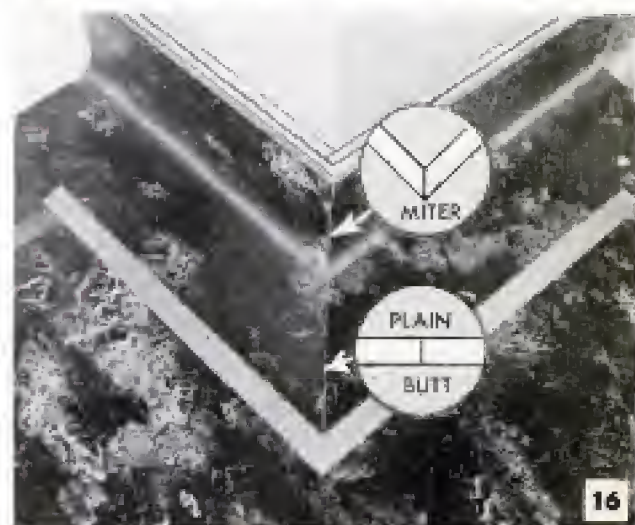
Installation with corner pieces: As with a flat-lay floor, either border or field can be laid first. Fig. 9 shows the field laid first, while Fig. 5 shows the cove border laid first. Wood strips nailed to the floor are used to crowd the cove strip against the fillet while the cement dries. The cove base itself is simply a strip of border-strip linoleum trimmed to the desired width and shaped to fit into the corner. The miter line on the floor in the corner can be cut singly as each piece is applied, Fig. 5, or the two corner pieces can be overlapped and cut together.

Either direct or pattern scribing can be used to determine the shape of the linoleum. If a paper pattern is used, Fig. 6, it should be fitted snugly in place without wrinkles. Felt underlay and lining paper make excellent pattern materials. Note that in scribing to the metal cap molding and corners that the dividers ride against the edges. Since the linoleum is to fit under the edge of both cap and corner, the dividers must be opened an additional $\frac{1}{8}$ in. when transferring this line to the linoleum, Figs. 6, 7 and 8.

Self corners: This style of corner takes more skill and patience, but since no corner pieces are used, the cove base can be flashed any distance up the wall, and the cove molding located accordingly. Self corners are usually scribed directly onto the linoleum itself. The first strip for the



Above, linoleum on self corner is cut at 45-deg. angle down to middle of fillet on outside corners



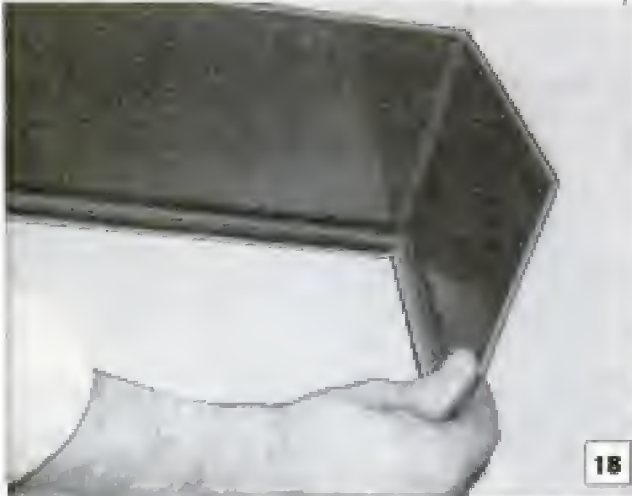
Above, from center of fillet to corner of field linoleum edge is cut at right angle to form plain butt

corner is pressed into place and scribed from the top down to about halfway across the fillet, Fig. 10. The second strip then is pushed into position, Fig. 11, and scribed and cut in the same manner. Both strips are cemented in place, then the cut is continued down across the fillet and out to the corner of the floor linoleum. After double-cutting in this manner, the top piece of linoleum is lifted slightly to permit removal of the waste end of the underpiece. Fig. 12 shows the finished inside corner.

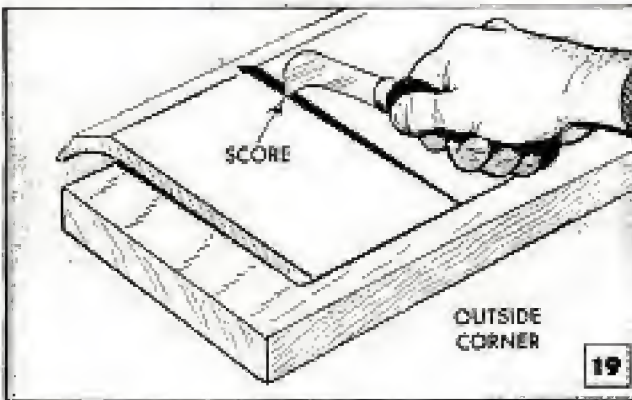
To fit an outside corner, the first strip is pressed into place and underscribed along a scrap piece of linoleum fitted against the adjacent surface, Fig. 14. After it is marked the corner is cut down to about halfway across the fillet, the cut being a 45-deg. miter, as shown in Figs. 15 and 16. After the linoleum is cemented in place, the cut is continued across the fillet to the corner of the floor linoleum. Note here, Fig. 16, that the cut edge is a 45-deg. miter down to the fillet, then gradually changes



Above, asphalt tile used for top-set cove is notched, heated and bent to form inside corner as shown below



Below, score back of asphalt tile and heat to form outside corner. Also cut slit in the surface on floor



Below, close-coupled inside and outside corners present neat appearance when shaped from one piece



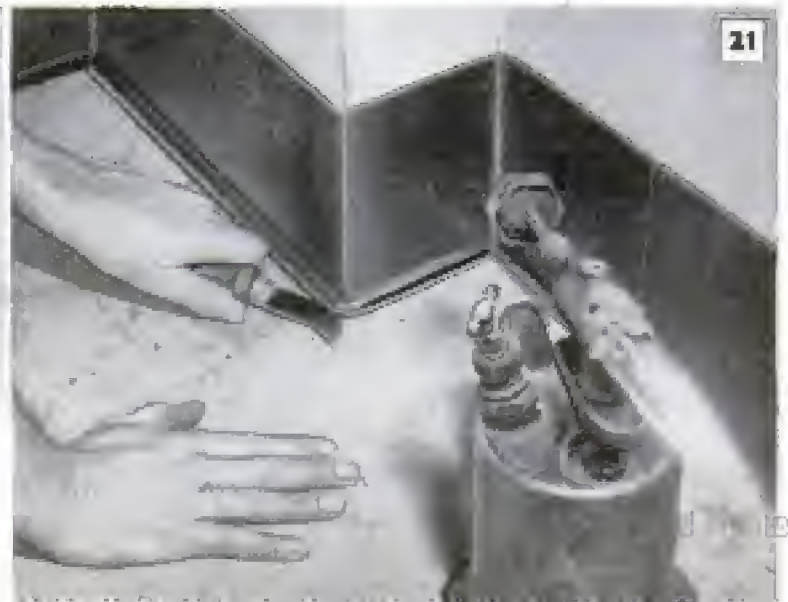
across the fillet to become a right-angle cut to form a plain butt the rest of the way across the cove.

Whether you use metal or self corners, the most difficult part of laying a base cove is shaping the linoleum to the required bend. The linoleum must be warm. If the room is cool, use a heat lamp to warm the linoleum before bending it. Form the bend as well as possible by hand before fitting. A better method is to use a forming board, shown in detail C, Fig. 13. Be sure the linoleum fits snugly against the fillet before scribing it. Also, double-check your cementing job; a few sandbags will help keep the linoleum in place while the cement is drying. Detail A in Fig. 13 shows a manufactured metal tool that is used to press the linoleum firmly against the fillet strip. Detail B is an easily made wooden tool used for the same job. Detail D shows a simple scribing tool that can be made if you do not have a regular one.

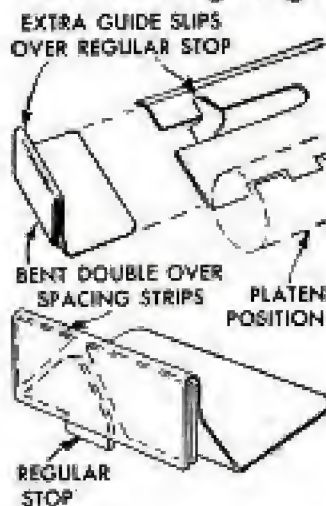
Top-set cove base: This style is easy to lay, being the same as the flashed type, except that the cove base is merely set on top of the floor covering, Fig. 1. If an asphalt material is used, corners are made by heating the spot with a blowtorch or heat lamp. To make an inside corner, notch the front of the molding, Fig. 17, apply heat and bend, Fig. 18. For an outside corner, score the back, heat and bend, Figs. 19 and 20. If the corner breaks slightly when bent, apply heat and mold shut with a hot knife, Fig. 21. Dust scraped from a scrap piece of asphalt can be used to fill in and "weld" a wider gap.

Rubber cove base must be cut and fitted the same as linoleum. Rubber does not cut as easily as linoleum and is usually fitted by using a special deep miter box and a fine-toothed saw. Some types of rubber tile are obtainable in preformed inside and outside corners, thus eliminating the problems of mitering. Preformed corners are cemented in place first and base strips are installed and fitted between them. ★ ★ ★

Scrap piece of asphalt tile is welded into opening left when outside corner is bent. Hot knife is used



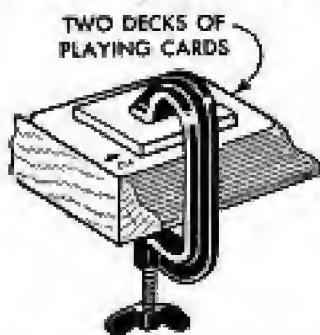
Auxiliary Stop on Typewriter Aids in Aligning Paper



The paper stop, which on some typewriters is so small that it does not effectively align the paper fed into the machine, can be fitted with an auxiliary stop to correct this trouble. A piece of light sheet metal—the metal from an ordinary tin can will do—is cut and shaped as shown in the detail, so

it will fit over the original stop. Two spacers cut from the sheet metal are fitted inside the fold of the auxiliary stop to hold it in place. To keep the spacers locked in, hold the stop on a flat surface and lightly center punch it over the spacers, or solder the assembly.

Molding Contour Quickly Copied



In an emergency, a molding contour may be copied quickly by using one or two decks of playing cards and a C-clamp. The ends of the cards are pushed firmly against the mold-

ing to copy the contour, then clamped. A small piece of plywood or hardboard should be placed on either side of the deck to provide a better grip for the clamp.

B. McClure, Los Angeles, Calif.

Empty Window-Cleaner Bottle Used to Spray Fine Oil



Don't discard the empty spray bottle that has contained a glass-cleaning liquid. Fill the bottle with a light oil and use the plunger pump to spray a fine mist of lubricant for rust-proofing tools.—W. H. Bradley, Point Reyes Station, Calif.

NOVEMBER 1954



Mirror Helps Lecturer View Slides Projected Behind Him

To eliminate the inconvenience of having to turn around in order to view slides being projected on a screen while he was speaking, one lecturer mounted a concave mirror in front of him. Thus as he talked he could look directly at the audience, and a glance at the mirror would tell him which of the slides was being projected at the moment. Interruptions are eliminated.

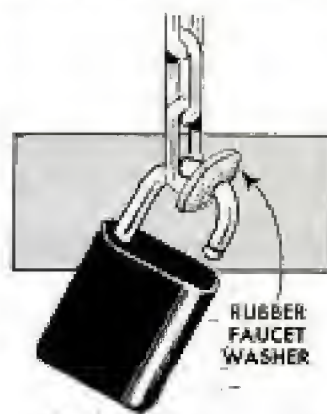
Victor Lamoy, Upper Jay, N. J.

Window Shade Protects Clothing

One car owner found that an old window shade provides a practical mat for preventing his clothes from being soiled when working on the car or repairing a flat tire. When rolled, the shade takes very little space in the car trunk.

Open Padlock for Boat Chain Held by Faucet Washer

The loss of an open padlock from the anchor chain of a rowboat may be prevented by forcing a rubber faucet washer over the shackle of the lock to hold it in place. If the original hole in the washer is too small and must be enlarged, use a drill or punch slightly smaller than the diameter of the shackle, so the washer won't work loose.—G. E. Hendrickson, Argyle, Wis.



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Ignition-Distributor Lubrication Adds Power and Performance

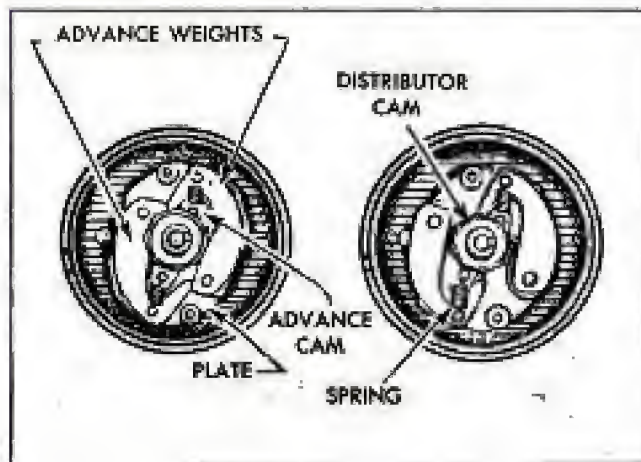
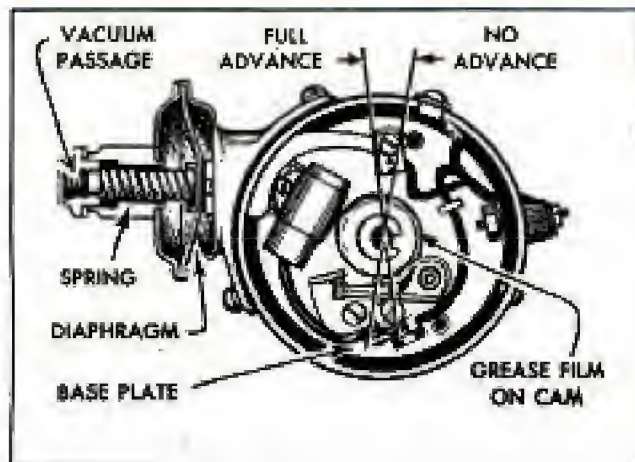
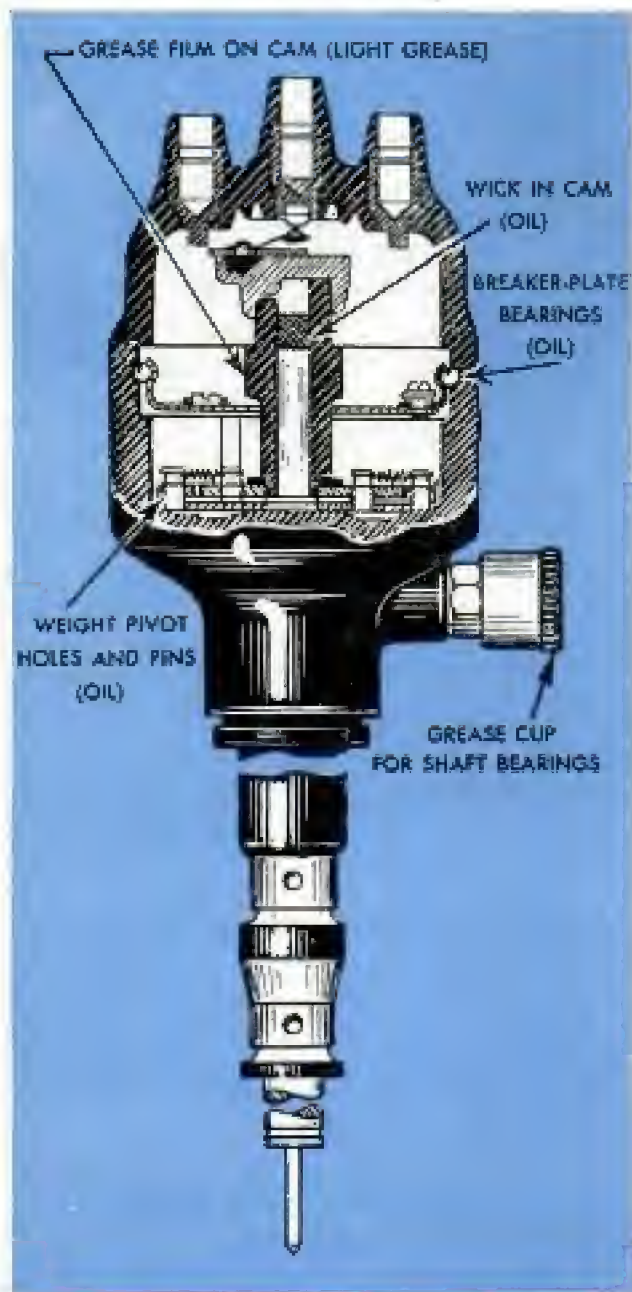
By Ed Packer

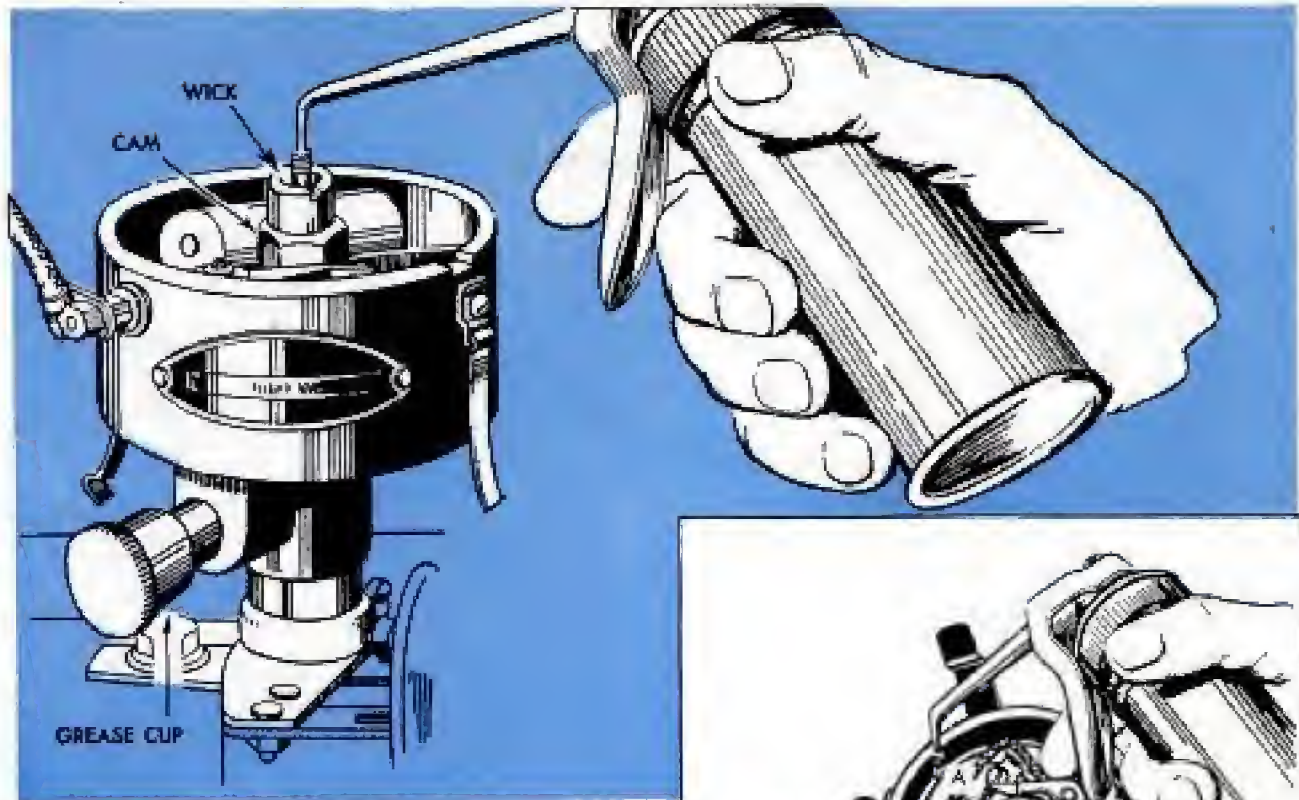
WHEN WAS THE IGNITION distributor on your car last lubricated? If the car has been driven more than five or six thousand miles, the distributor should be checked for lubrication. It is a precision instrument and, as such, needs correct care. Even a well-tuned engine cannot function correctly with a worn distributor. There are five places on a distributor that require lubrication, detail at left: The wick on top of the cam shaft, the cam lobes, plate bearings, counterweight pivots and the shaft bearings.

Do not overdo the job; too much lubricant is worse than none at all and can stop the engine completely. Just a slight amount of oil or grease will insulate the breaker points and prevent a hot spark passing between them, or it may cause excessive arcing, which will pit the points in a short time.

The shaft bearings of the distributor are lubricated by either a grease or oil cup located under the main body of the distributor housing. When the grease cup is full, a turn or two every few thousand miles generally is all that is required. If an oil cup is used, just a few drops of oil are needed at similar intervals. It is best to check in your owner's manual, or ask a competent mechanic to learn the recommended number of miles for your particular car.

Do not overlubricate the shaft bearings. It is possible for the engine heat to vaporize excess oil or grease and force the fumes up the shaft into the distributor housing. The cooler air in the distributor will condense the vapor and a film of oil or grease will settle on all parts of the distributor. This condition often is encountered in older cars where the distributor-shaft bearings have become badly worn, and





even fumes from the engine crankcase can pass up the shaft.

When you remove the distributor cap and take out the rotor, you will notice a wick under it that requires two or three drops of oil about every 5000 miles. The wick lubricates the upper end of the short camshaft, which is moved slightly on the main distributor shaft by counterweights to automatically advance or retard the spark according to engine speed.

If the distributor is of the type shown in the right-hand drawing on this page, a drop of light oil should be placed on each of the ball bearings on which the distributor plate rides, points A in the drawing. On later models of this type of distributor, an oiled felt pad under the plate lubricates three plastic buttons on which the plate turns. The pad is oiled through a hole in the plate, point B in the right-hand drawing. Should the plate be removed from a distributor of the type which has three ball bearings riding in a groove machined in the housing, care must be taken not to lose the balls and to replace them properly when reassembling the distributor. The distributor plate is turned on the bearings or plastic buttons by a diaphragm in a vacuum chamber connected to the distributor. This is shown in the lower left-hand drawing, page 198. The diaphragm is actuated by changes in the intake-manifold vacuum. Manifold vacuum varies with the load on the engine, rather than the speed.

The machined faces of the cam lobes on the distributor shaft require a very fine film of hard grease. This film prevents too-



rapid wear of the fiber block on the pivoted arm of the ignition points. If this block—which may be under 18 to 20 oz. of pressure and struck by the cam as much as 1500 times a minute at 60 m.p.h.—should wear down too much, the points will not open at all and the engine will not run.

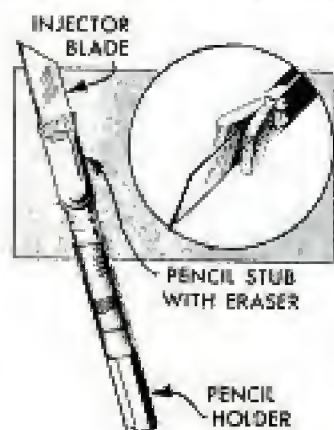
The counterweights beneath the distributor plate should be oiled or packed with grease about every 5000 miles. Unless you are familiar with an ignition distributor, do not remove the plate to get at the weights. Leave this for an ignition specialist. If you do remove the plate, you will see the counterweights as the lower right-hand drawing on page 198. The detail on the left shows the position of the counterweights when there is no advance, while the detail on the right shows full advance. The places requiring lubrication are, of course, the pins on which the weights pivot. Some distributors require only a drop of oil on each of these pins, others must be packed with light grease. It can be seen that if too much grease were used, the weights would not be able to move outward to function properly. The same is true, of course, if the pivots are dry and rusty. ★ ★ ★



Paint Provides Vapor Barrier Beneath Unheated Attic

The problem of excess humidity in an unheated attic space, caused by moist air passing through the plaster and loose insulation in the ceiling, can be solved by using a good grade of moistureproof paint on the ceiling. Oil, aluminum and rubber-base paints, as well as spar varnish can be used. Apply the paint with a brush or roller, thoroughly covering all cracks and irregularities. Two or three coats will assure more effective protection. After the paint has completely dried, the ceiling can be wallpapered, if desired. Outside walls which do not have a vapor barrier also can be protected with paint in the same manner before they are covered with wallpaper.

Improvised Stencil Knife



While doing some art work I misplaced my stencil knife and, needing one immediately, improvised the one illustrated. A pencil stub, with the flat-type eraser shown in the detail, was screwed into a pencil holder. The eraser was slit part

Automatic Clothes Driers . . .

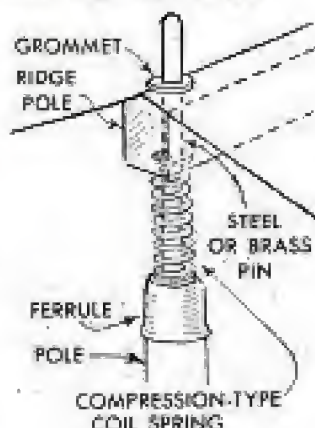
Whether you now own a clothes drier or are just thinking about buying one, you certainly want to know as much as possible about them. What different types are available. How they work. What to do about lint. How a drier should be vented. The answers to these questions and many others will be waiting for you when you read next month's informative roundup story on clothes driers

way down and an injector-type razor blade, the end of which was ground to a bevel, was inserted in the rubber. Whenever the blade becomes dull it is a simple matter to replace it with a new one.

Earle Engdahl, Oakland, Calif.

Tent Roof Kept Taut By Springs

A canvas-tent roof can be kept taut even though the canvas becomes stretched, by using a compression-type coil spring to keep the ridgepole under tension. Steel pins are driven into the upper ends of the ridge-support poles, which are wound with wire

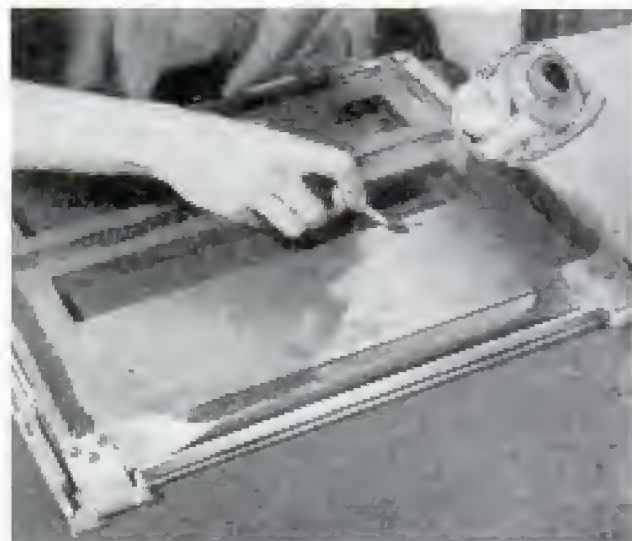


or fitted with ferrules to prevent splitting. The pins fit into holes drilled through the ridgepole and extend through holes punched and grommeted in the canvas roof. Washers are used on each end of the springs, which are slipped over the pins and placed under tension by drawing down tightly on the tent-roof lines.

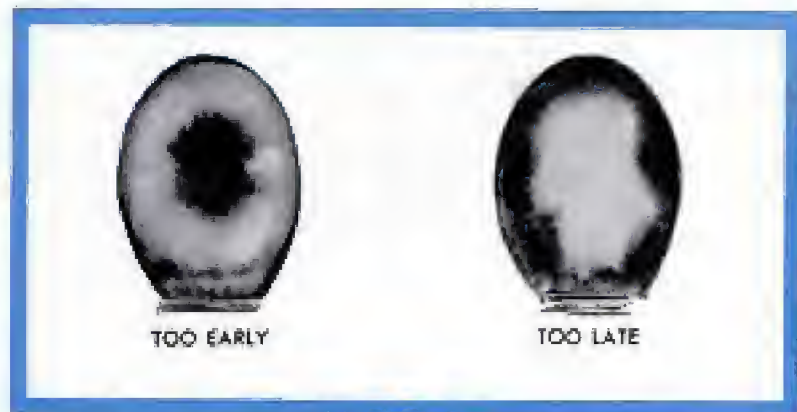
Rubber Cement Painted on Easel Prevents Slipping

If the enlarging easel slips so easily on the baseboard of an enlarger that there is a chance of moving it when inserting the paper after the picture is composed, coat the bottom of the easel with rubber cement. When the cement dries it will leave a thin film of rubber which will effectively prevent the easel from sliding, yet permit it to be moved easily when necessary.

Virginia Hanson, Los Angeles, Calif.



How to Check Flash-Gun Synchronization



Any variation from full intensity in photoflash synchronization can affect your flash pictures through a considerable exposure range. A simple check quickly reveals any discrepancy. Stand your flash gun in front of the camera, as pictured above, and focus on the flash bulb. Make sure that all electrical connections are tight, and remove any near-by objects that might throw sharp reflections, either into the lens or onto the flash unit. Open the lens to full aperture, then shoot, using two or more speeds, and develop the film. If the flash is too early you will get an image similar to

that shown at the left above. Too late, the image will appear something like that indicated at the right. If the flash is "right on the nose," the image will be all black, or very nearly so, with possibly a slight halation at the edges. Phosphorescent paper can be used to make the check instead of film. It is used in the same manner as film but does not require developing. After exposure, the phosphorescent paper is simply viewed in a darkened room.

Circular Gaskets Cut Quickly With Razor Blade in Compass

A section of discarded razor blade, fastened to the pencil side of a compass speeds the cutting of circular gaskets. By using the compass you can cut them directly



from the gasket material, eliminating the need for drawing a circle and then cutting with a knife or scissors. A single-edged razor blade with a hole near each end is the type most readily adapted to this purpose. Hold the blade in a vise or pliers and snap off the blade close to one of the holes, so that a length of blade about $\frac{1}{2}$ in. long remains. Next, replace the pencil with a short length of dowel. File a flat near the end of the dowel, shaping it so the shoulder of the flat is at a slight angle, as shown in the photo. A small wood screw is used to hold the blade against the flat of the dowel.

Detergent Keeps Glass Clear

An application of a liquid detergent to eyeglasses, mirrors, windshields and other glass surfaces will prevent moisture condensation, or "steaming." Apply the detergent with an atomizer or a small wad of cotton and then polish with a clean cloth.



Multiple prints must be worked out in detail. Select negatives that will print on the same grade of enlarging paper. Make sketch like that above to determine placement of negatives. When printing, vignette each image with masks like those below

By John I. Fish

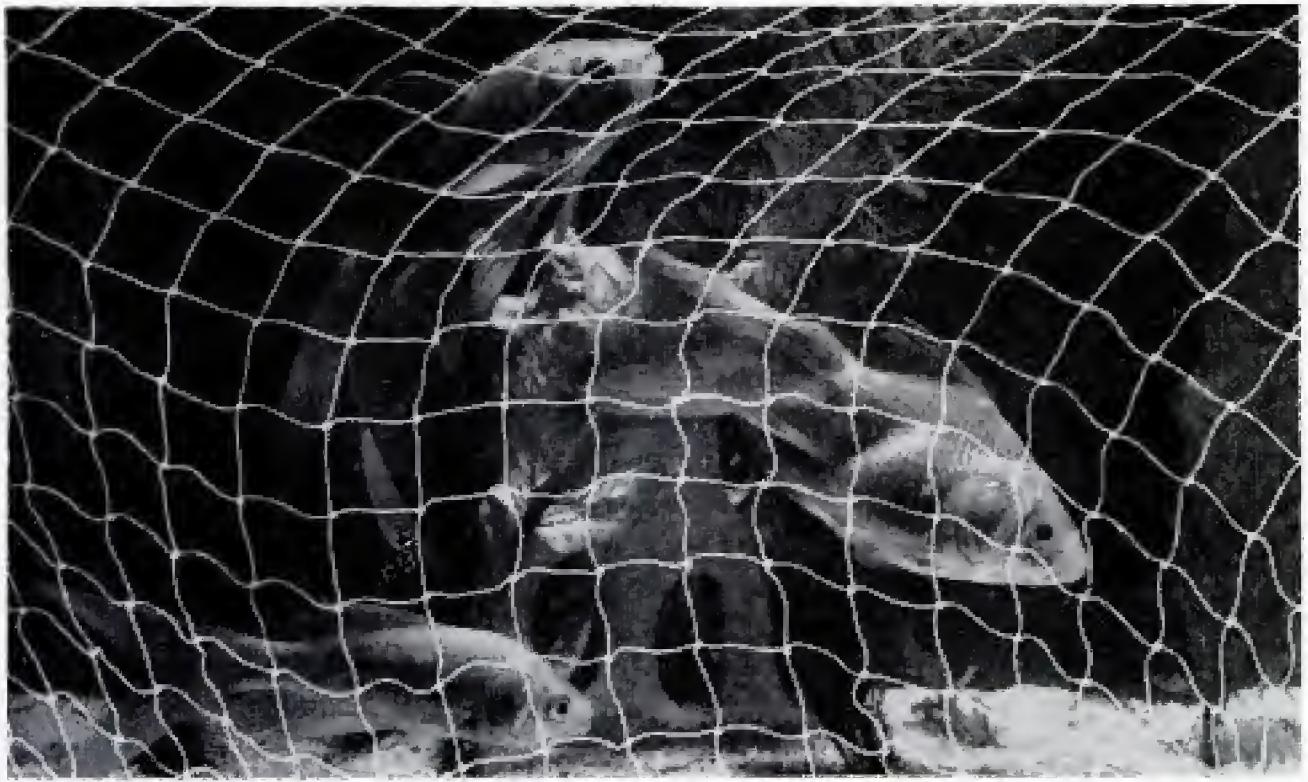


MULTIPLE-PICTURE TRICKS

A SMALL FILE of your favorite negatives, plus a measure of creative handling in the darkroom, can give you photoprints that portray qualities of spontaneity and appeal in striking combinations. As an example, five separate negatives were used in making the appealing multiple portrait reproduced above. Note how the photographer has achieved the effect of a single print by using the simple process known in the darkroom as vignetting. In this the individual images are projected through cutouts made in pieces of cardboard, as in the small photo at the right. Each cutout is held about halfway between the enlarger lens and the paper and kept in motion throughout the exposure.

The steps in making a multiple portrait

must be carried out in detail. Select negatives that will all print on the same grade of enlarging paper. Make test exposures of the enlarging paper that is to be used and process identically. This is important as all exposures will be printed on the same sheet of paper, and any variations in developing will cause the pictures in the multiple print to vary in density. Make simple sketches of that portion of each image that is to be used so you can determine the area it is to occupy in the multiple print. Note how this has been done in the detail at the right of the photo above. Then print the separate negatives onto the proper areas of the enlarging paper. As each successive exposure is made, use the vignetting cardboard cutout to prevent light from



Printing through fabric or open mesh gives striking effects. Care must be taken in selection of negative

reaching any other area of the paper except that which is being exposed. Keep the mask in motion to blend the edges of each image. Develop precisely the same as the test exposures. To avoid errors in placement, mark the top of the enlarging paper on the back.

You can have a lot of fun by simply placing objects on top of a sheet of photographic paper and exposing to light. For best re-

Unusual photoprints are made by simply placing various objects on paper and exposing as shown below

sults, use the enlarger as in the lower left-hand photo. The photo at the lower right is a good example of what you'll get. Almost any common object can be used, either opaque or partially translucent. This includes glassware, plastic containers and utensils, tree leaves, blades of grass, heads of bearded wheat or barley, fern leaves and so on. Other variations can be carried out with unusual results. For example,

This picture is an example of what you can expect. Opaque and translucent objects make best pictures





These two prints were combined to make the striking picture on the opposite page. The lighthouse negative is used as the base negative and the cloud negative is printed in by masking out the foreground



place several small seeds, feathers or insects in the negative carrier of the enlarger. Photograms made in this way are similar to those taken through a microscope. To do this work in enlargers that do not have glass negative carriers, clear the emulsion from two sheets of film by washing in a fixing bath and use these as a carrier.

Other interesting multiple-print tricks include printing the image through a fabric

Negative printing can give you such unusual pictures as this one. Fine for wall decoration when framed



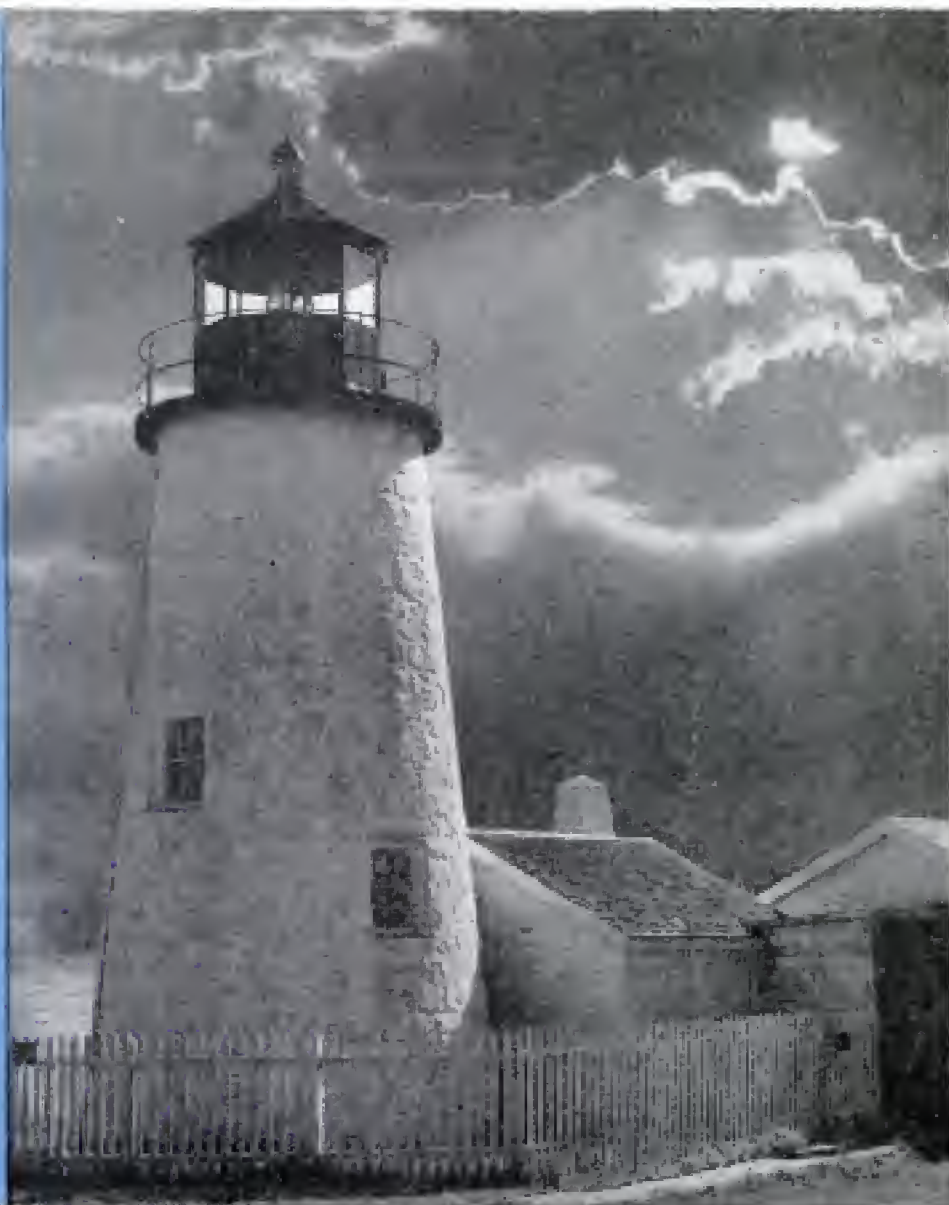
or open-mesh netting. Photos at the lower right and at the top of the preceding page are good examples of the variations and novel effects possible.

Another stunt that gives you really striking results is negative printing. The first step is to make a print from the chosen negative on commercial sheet film rather than paper. In other words, you make a film positive by printing the negative onto commercial film. The positive should be

An example of an exposure made through fairly fine-mesh fabric. Correct exposure is determined by test



Compare this photo with that at the upper left on opposite page. Clouds printed in by a second exposure give a feeling of completeness to the scene. After first exposure foreground is masked out with mask shown below, second exposure is made



the same size as the negative carrier or, if you prefer, you can make the positive full picture size and make contact prints from it. First, run a test strip, just as you would when making prints on paper, to get an exposure range suitable for that particular negative. Develop the film in a soft-working developer. The time will vary, depending on the contrast in the negative, but about 7 minutes at 68 deg. F. should provide a reasonably accurate guide. In the exposure tests, aim for a positive that will print on grade-2 paper. This will give you several grades on each side of the normal, should the negative in hand require this variation. When the positive turns out satisfactorily, print the film on paper just as you would a regular negative. The lower left-hand photo on the opposite page is a good example of what you can expect.

Printing in clouds can bring life and feeling to a plain, uninteresting picture. Note the blank-sky print at the upper left on the opposite page and contrast with the one above with a cloud sky printed in. As

the first step, place in the easel a sheet of opaque (black) paper of the same size as the enlarging paper to be used. Project the original negative and outline all details and areas in the foreground with a pencil. Then cut carefully along this line to produce a mask which will be used to prevent the cloud negative from printing in areas below the horizon line and over any objects in the foreground, such as the lighthouse in the photos above and at the upper left on the opposite page. Note the mask at the left of the photo above. Determine the correct exposures for both the original negative and the cloud negative by running separate test strips for each one. Be sure to mark the back of the enlarging paper so that you can replace it in exactly the same position for the second exposure. Precise alignment is of the greatest importance. With most work of this kind the trick is in cutting and placing the mask accurately. Be sure to place the paper in a light-safe cabinet or box between exposures. ★ ★ ★

Tire Chains Quickly Put on By Using Slotted Ramp



1" SLOTS IN 2" X 8" PLANK

Most of the problems ordinarily associated with putting tire chains on a car can be eliminated by using a ramp consisting of a 3-ft. length of slotted 2 x 8-in. lumber. The slots are 1 x 1 in. and are spaced to fit the cross links of the chain. One end of the plank is beveled to provide an approach and a stop block is spiked to the other end. In use, the chain is placed in the slots, the

car is backed onto the ramp until the tire contacts the stop and the chain then is pulled up around the wheel. The ramp also could be made by nailing blocks to a plank.—Karl Schoeller, Oswego, N. Y.

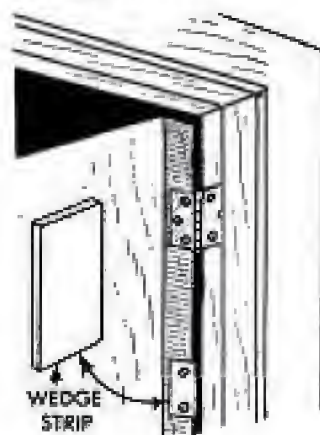
Jigsaw Used to Cut Asphalt Siding

For cutting odd shapes and angles when applying asphalt siding, a saber or jigsaw is an excellent tool. The tarry underlayer and gritty outer surface will quickly dull a saw blade, so it is suggested that you use an old, discarded blade.

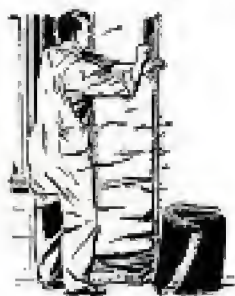
Ralph Hitner, Philadelphia, Pa.

Shim Silences Rattling Latch

A door that rattles in a draft because of a loose latch can often be quieted by fastening a thin wood or cardboard shim to the hinge edge of the door. The shim should be slightly thicker than the clearance between the door and the jamb so that when the door is closed it is forced toward the striker plate on the jamb. The latch thus is held tightly against the striker plate and cannot rattle.



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SHOP NOTES

CIRCLE TOOL DOES MANY JOBS

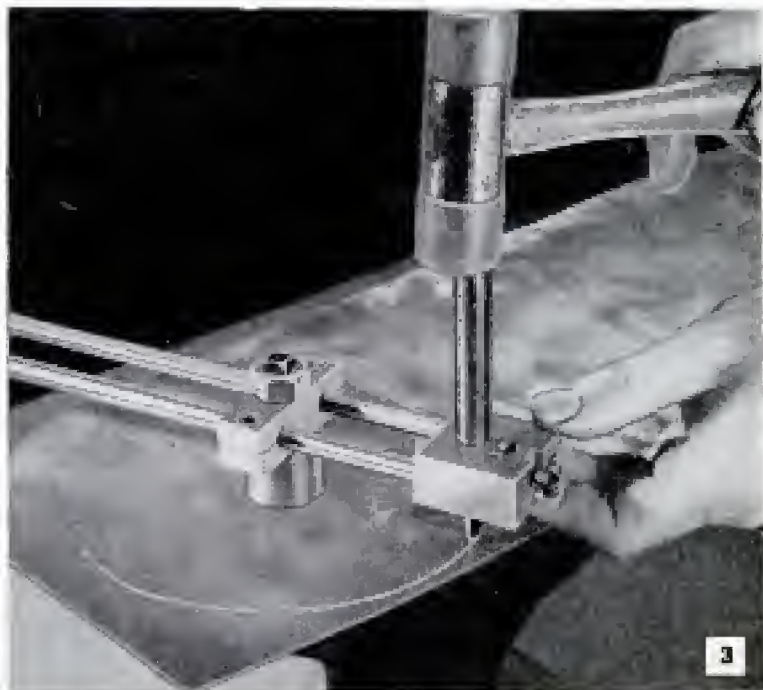
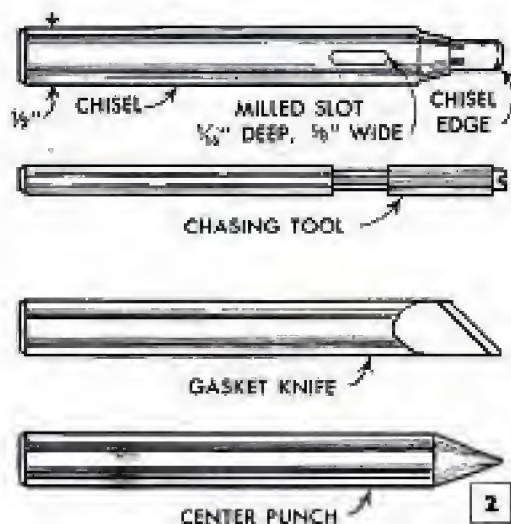


By Walter E. Burton

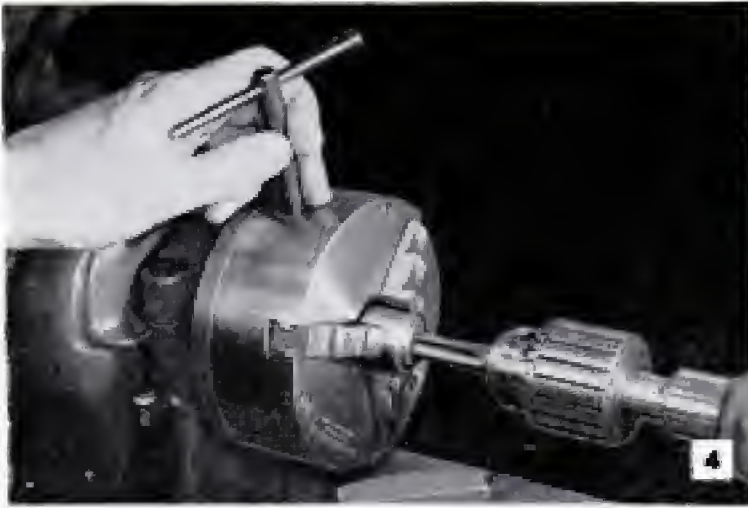
BASICALLY, THIS UNIT is a type of trammel, or compass, having an adjustable head for mounting various cutting and embossing tools. It has a wide application in craftwork. Dimensions of the unit detailed provide a capacity ranging from 1 $\frac{3}{4}$ to 20 in. in dia. This range can be increased somewhat without the use of heavier material. The unit consists of a sliding head which holds the cutting tool, two

round slides and a swiveling base attached to the work or the bench top as required, Figs. 6 and 7.

The sliding head, Fig. 10, is made from a piece of mild steel (you can use oil-hardening steel) $\frac{3}{8}$ in. thick and 1 $\frac{1}{2}$ in. square. This block is drilled, tapped and slotted as indicated in the details. Begin by squaring the block, either by milling or filing by hand. Note in the detail that the block is



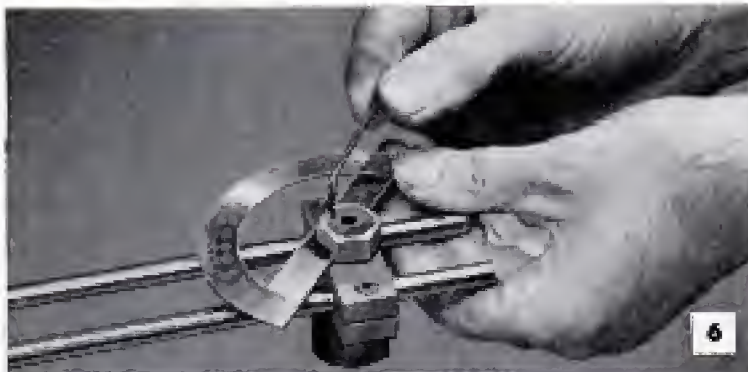
Various types of chasing tools, chisels and punches can be used in the circle tool. Photos above and at the right picture manner of using unit on circular work. It can be attached to the bench or work



Tapping counterbore in the round base can be done in the lathe or in a drill press. Use a bottom tap for full-depth thread



Drilling the pivot bolt axially also can be done in the lathe or drill press. Hole is for insertion of $\frac{1}{4}$ -in. attachment bolt



Above, a protractor is fitted into a slot cut in the head of the pivot bolt as in detail on opposite page. Protractor is held in place with setscrew. Below, circle tool can be attached to work or bench top. Works on full circle or any size segment



slotted across one edge, the slot forming a slide for the tool, which is held in place by a flat spring as indicated. The spring is attached to the block with an 8-32 screw, Fig. 10. The finished head, with the parts in relative positions, is shown in Fig. 8. Note in Fig. 10 that the head is supported in the horizontal position by a $\frac{1}{8}$ -in. pin. The center-to-center distance of the holes for the rods should be $1\frac{1}{16}$ in., although the dimension is not critical.

The base consists of three parts, the pivoting head, which is similar to the tool head except that it is of $\frac{3}{4} \times \frac{3}{4} \times 2\frac{1}{4}$ -in. stock, the pivot bolt and the round base. The $\frac{1}{2}$ -in. pivot bolt, Fig. 9, is turned into a tapped counterbore in the round base. The hole in the base is threaded with a bottom tap, Fig. 4, and the bolt is turned in through the swiveling head as in the sectional view, Fig. 9. It will probably be necessary to file the end of the bolt to permit it to be turned in tightly and yet allow the head to swivel without undue play. Note that the bolt is drilled lengthwise as in Fig. 5 to permit insertion of a $\frac{1}{4}$ -in. bolt for attaching to the work. Slot the head of the pivot bolt for the protractor, which is held in place with an 8-32 setscrew as in the left-hand detail, Fig. 9, also Fig. 6. Some protractors of the type used will require notching as indicated by the dotted lines. A snap band of sheet metal cut with an indicating point on one edge, is bent to a friction fit over the two rods in the position shown in Figs. 9, 10 and 11. An index mark is made on the indicator point as in Fig. 9. Note how the swiveling block is slotted in from both ends, forming clamps that are tightened with setscrews to hold the rods in the desired position. The screw holes are counterbored, the counterbore for the head and body of the screw being made in one jaw of each clamp.

Figs. 2 and 3 show the various tools and how they are used in the unit. Tools with $\frac{1}{2}$ -in. round shanks are held in the round hole of the same size drilled in the head, Fig. 3. Square-shanked tools are held in the groove in the head as in Fig. 1. Figs. 1 and 7 show the unit clamped to the work and to the bench top. ★ ★ ★

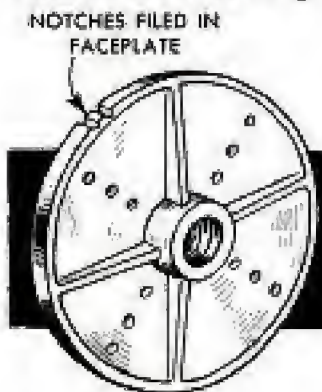
Belted Grinder Attached to Post Takes Little Shop Space



Mounted on scrap lengths of 2-in. stock nailed to a post as shown, a grinder will require a minimum amount of space when installed convenient to a work area in a garage or tool shed. The electric motor is kept free of grinding dust by mounting it on crosspieces attached to the beam several feet above the grinder. The grinder never should be installed in an area where flammable materials near by, or on the floor, create a fire hazard.

G. E. McVickar, Bethesda, Md.

Notches Filed on Faceplates Assure Centering of Work



Because the screw holes in various lathe faceplates are not drilled in identical locations, changing work from one plate to another will throw the work off center. To overcome this problem, one woodworking-shop instructor filed a different number of notches in the edges of the faceplates used on his lathes, and has the students mark their projects accordingly.

Crayon Lines Aid Soldering

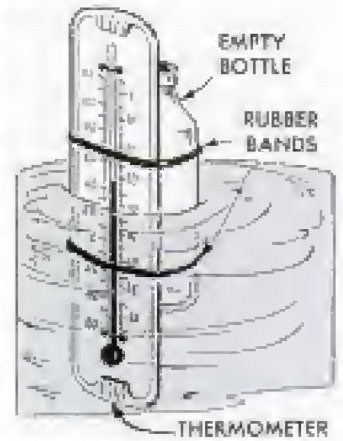
Sheet-metal seams can be soldered neatly by first drawing heavy, parallel lines on both sides of the seam with a wax crayon

and ruler. The wax usually will check the flow of the solder and, in the event the solder does overflow onto the lines, the wax will prevent it from adhering to the metal and simplify later removal.

Tom Riley, Portland, Ore.

Improvised Dairy Thermometer Uses Empty-Bottle Float

If a regular dairy thermometer is not available when it is desired to keep a constant check on the temperature of a fluid, any standard thermometer, plus an empty bottle, may be used as a substitute. The thermometer is fastened to the bottle



and can be adjusted to float at any depth by pouring a small amount of water into the bottle as ballast.

G. E. Hendrickson, Argyle, Wis.

Calking-Gun Nozzle Cleaned By Soaking in Thinner

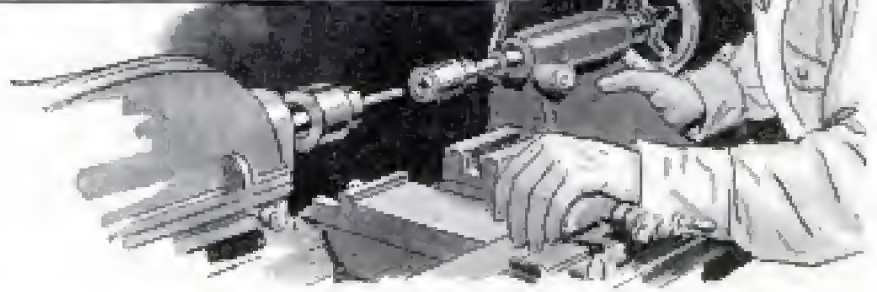
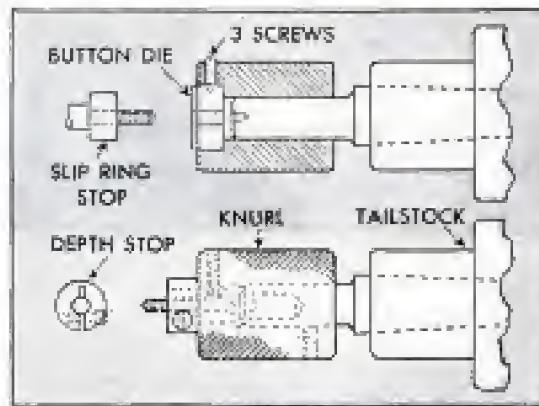
The clogged nozzle of a calking gun, which usually is cleaned by boiling in an alkali solution, can be cleaned in a fraction of the time by soaking it in lacquer thinner. Simply pour a small amount of the thinner into a glass jar and drop the nozzle into it. A few hours of soaking will completely clean a badly clogged nozzle. **Caution:** Lacquer thinner is highly flammable. Keep away from flame.

Ken Murray, Colon, Mich.



Taps and Button Dies Held in Knurled Sleeve on Hollow Arbor

Sliding on a hollow arbor held in the tailstock, a knurled sleeve will permit controlled threading and tapping in a lathe with regular taps and button dies. The end of the sleeve is machined to receive bushings with various inside diameters to accommodate several sizes of dies and taps. A setscrew in the sleeve locks the tap or die in place. In use, the work to be threaded is turned by the headstock, and the tailstock wheel is used to bring the tap or die against the work. Holding the knurled sleeve allows the work to be threaded, and releasing the sleeve allows it to turn freely on the hollow arbor. The lathe then is stopped, reversed and the sleeve is held to permit



the tap or die to be withdrawn. A depth or slip-ring stop may also be used.

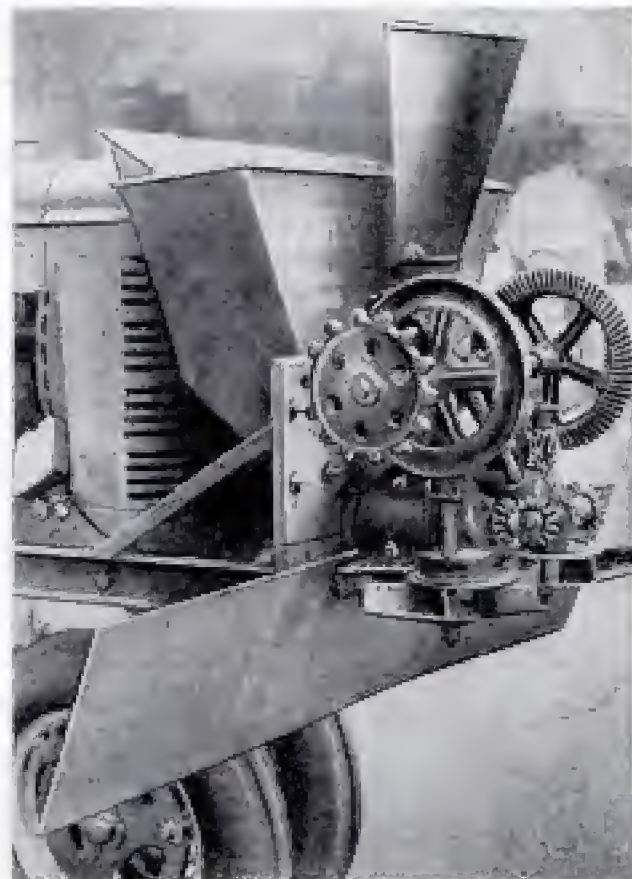
W. C. Betz, New Britain, Conn.

Seeder Mounted to Front of Tractor Provides Accurate Control

An endgate seeder mounted on the front of the tractor provides more accurate and flexible control than a towed wagon, when used in small or irregularly shaped fields or meadows. The seeder is supported by

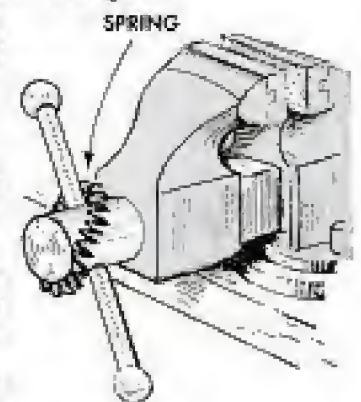
two steel channels, 3 x 24 in., bolted to the tractor frame, and is driven by a sprocket mounted on the belt pulley. A flat-link chain runs from the powered sprocket to the sprocket on the seeder. Various-sized sprockets will have to be tried, until a combination gives the right speed to the seeder when the tractor is run in high gear. A piece of sheet steel, 11 x 60 in., is mounted across the front of the tractor to act as a seed deflector.

A. M. Wettach, Mt. Pleasant, Iowa.



Spring on Large Vise Handle Prevents Pinched Fingers

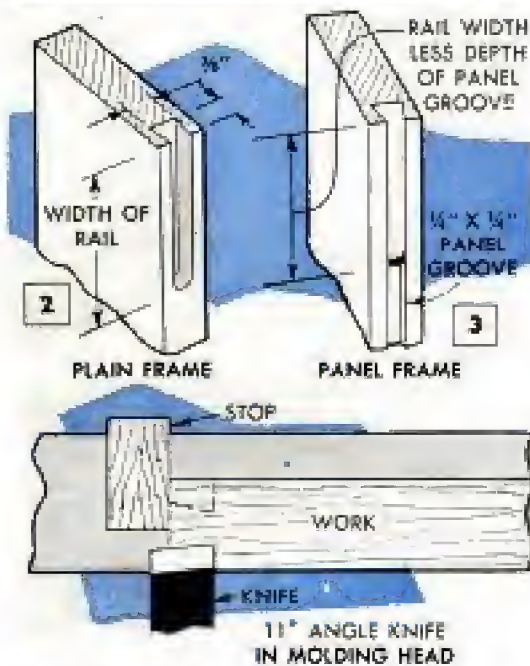
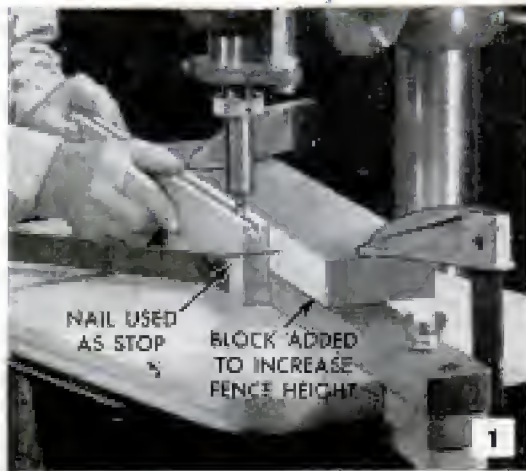
A short length of coil spring can be used to overcome the finger-pinching tendencies of the sliding handle of a large machinist's vise. As shown in the sketch, the spring is stretched tightly around the handle and the end of the



vise screw, and then the ends of the spring are hooked together. The handle will stay put in any position and yet can be moved easily.—Andrew Vena, Philadelphia, Pa.

HOW TO CUT DOVETAIL JOINTS

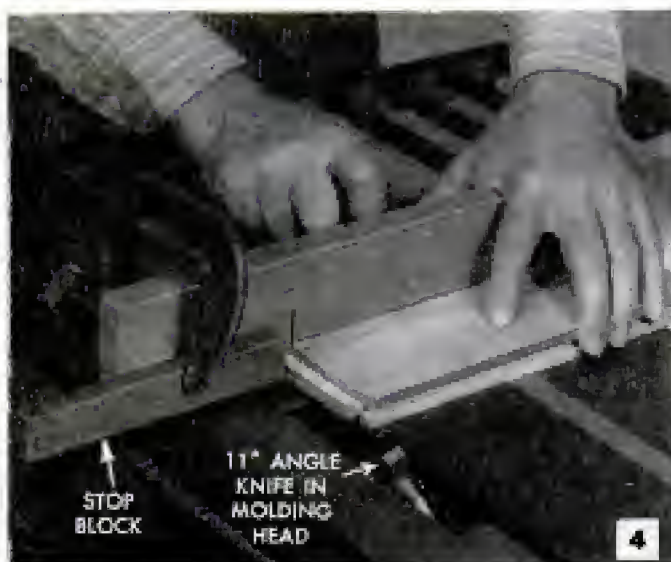
By Sam Brown



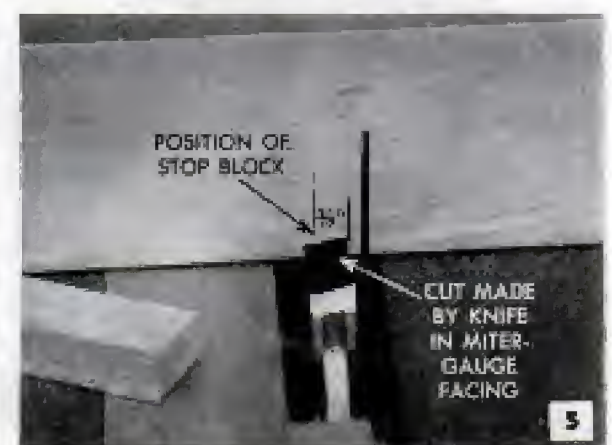
SELF-LOCKING and as strong as the wood itself, the dovetail joint is one of the oldest and best methods of wood joinery. Most familiar is the multiple-dovetail joint used in drawer construction in all the better-grade cabinets, but the single dovetail also has many applications. Both single and multiple dovetails are made in a variety of sizes. Dovetails cut on an 11-deg. angle are almost universally used in present-day joinery. In modern dovetail cutting the sockets and pins are spaced uniformly, but in older types of joinery the pins varied in relation to the spacing. In some cases only one or two pins were used, even on wide boards.

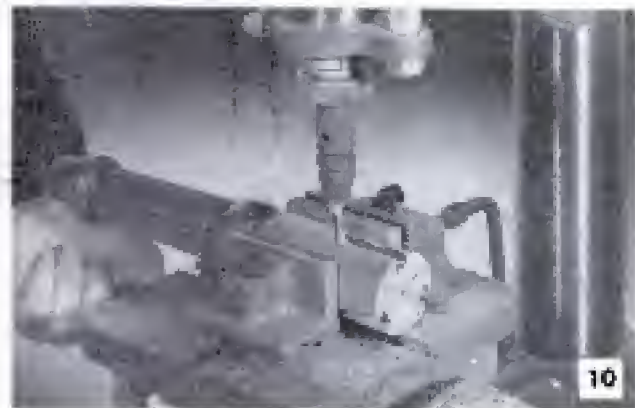
Dovetail grooving: Figs. 1 to 14 inclusive picture and detail methods of cutting dovetail grooves and matching dovetail tenons on the circular saw and drill press. When making a frame, Figs. 1 to 5, the groove is first cut with a router bit on the drill press as in Fig. 1. Note that a high fence must be used to support the work adequately. Note also in Figs. 2 and 3 that this type joint can be used when joining either a plain frame or a paneled frame. The matching dovetail tenon is cut on the circular saw as in Figs. 4 and 5, using a molding head on the saw arbor. After the first pass the work is turned over and the second pass made. The resulting tenon should be a sliding fit in the dovetail groove. As shown in Fig. 6, an allowance must be made in the depth of the groove to provide clearance for the end of the dovetail.

A similar procedure is used when joining rails to square legs, or curved legs to a single round column as in Figs. 7 to 14 inclusive. When routing



Details and photos at left and below show how to cut dovetail grooves and matching dovetail tenons. Joint is used when framing either plywood or raised panels. Groove is cut on drill press



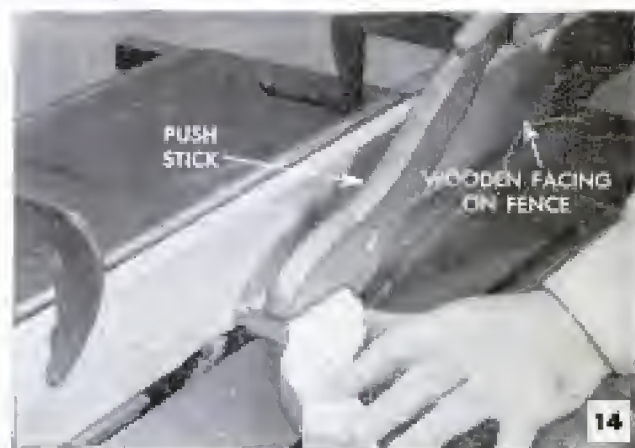
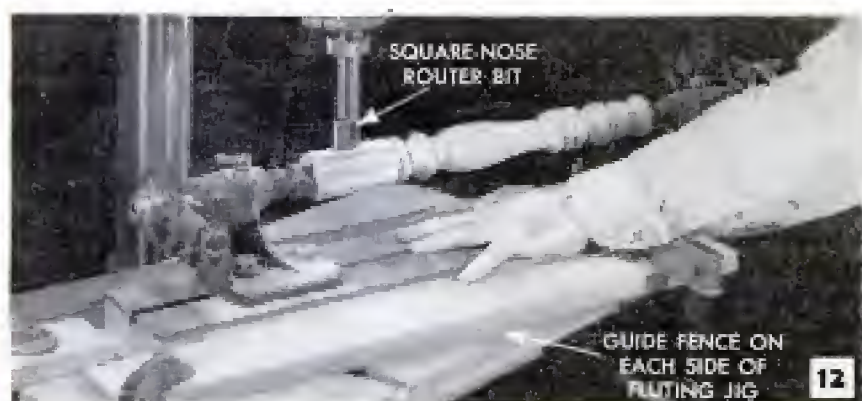


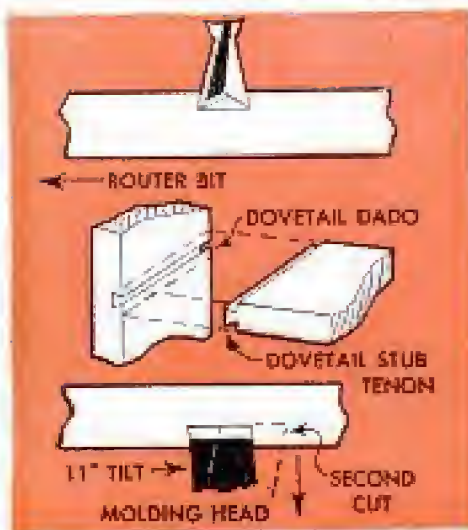
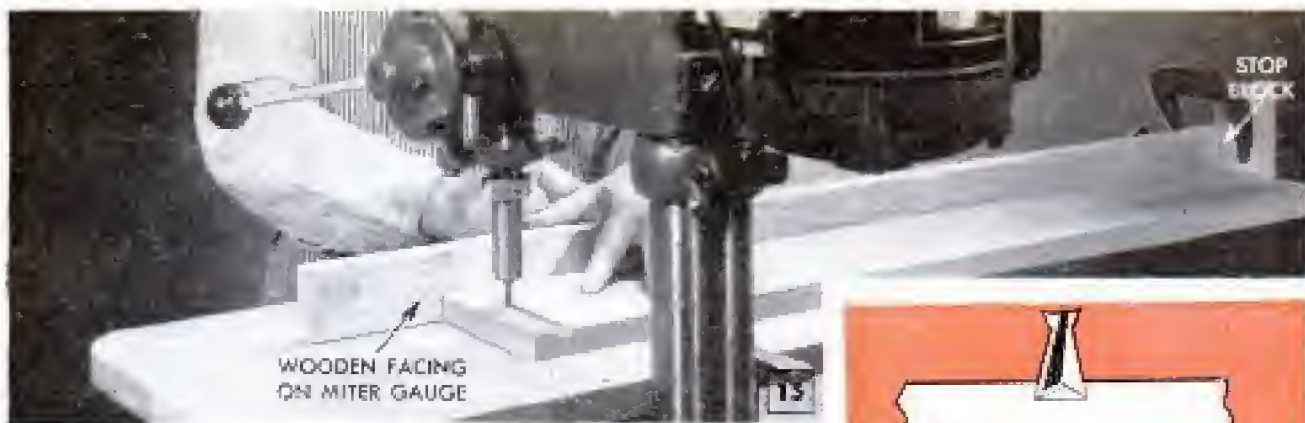
grooves on adjacent sides of the leg care must be taken to keep the proper sequence of operations so that the parts will assemble correctly. This is indicated in details A and B in Figs. 7 and 8. The grooves are run first with a straight router bit, then finished with the dovetail bit. Note in Fig. 6 how the tenon is offset when the construction calls for a flush rail.

Dovetail grooves in round work: When cutting dovetail grooves 120 deg. apart, Fig. 11, the work can be mounted between

indexing centers as in Fig. 12. When there are four legs the surface is sometimes squared with a router bit as in Fig. 12, this being the first operation after turning. Dovetail tenons are cut on the curved legs as in Fig. 14. Note in Fig. 11 that the dovetail shoulders, or cheeks, are curved slightly so that they join accurately to the curved surface of the column. This can be done by bandsawing to the correct contour.

Dovetail dados and sockets: Dovetail dado cuts are made in a manner similar to

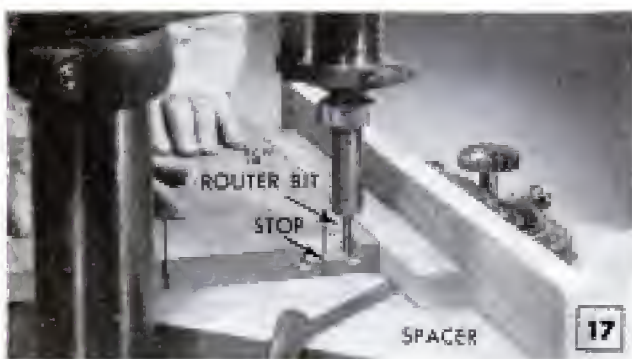




dovetail grooves except that the cut is made across the grain as in Fig. 15, using the drill-press setup pictured. Here a special table is bolted to the regular machine table and grooved for the miter gauge which is taken from the saw table to serve this purpose. A long wooden facing, carrying a stop, is screwed to the miter gauge. The dovetail tenon is cut as in Fig. 4. Another method of cutting the dovetail

is shown in Fig. 16, using the molding head tilted 11 deg. as in the detail at the right of Fig. 16. Although the molding-head setup is much the faster of the two methods, it is subject to possible error as the stock must be reversed for the second cut. Accuracy requires that the edges of the stock be parallel.

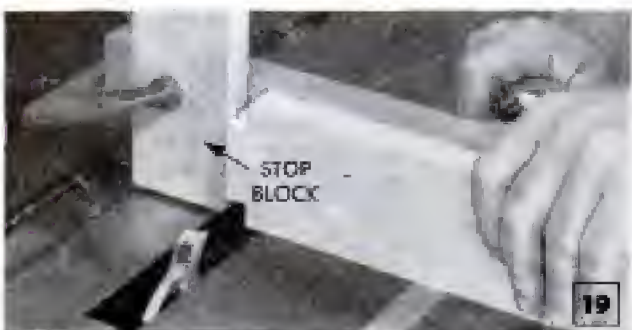
Single dovetail joint: Sometimes referred to as a pocket dovetail, this joint is often

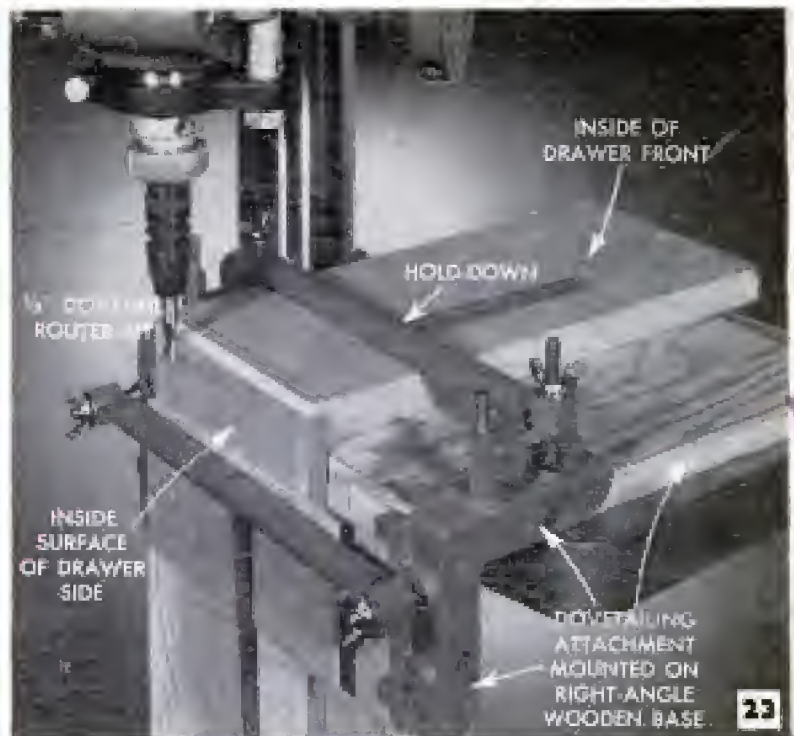
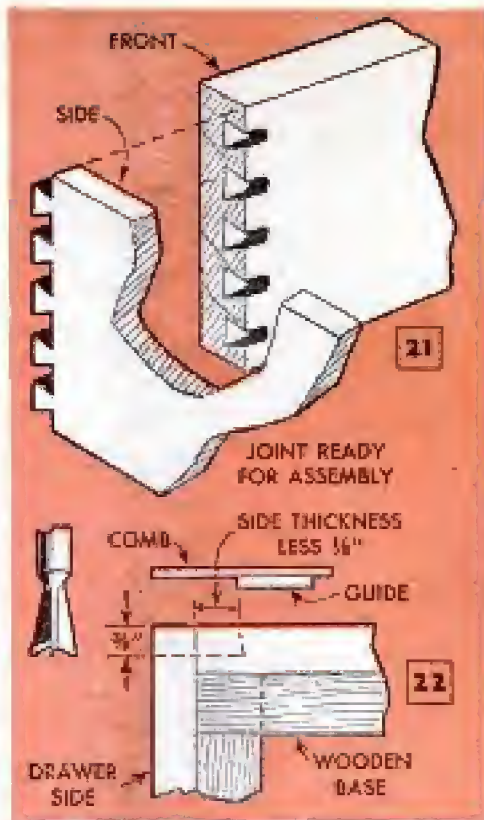


Above, first cut in making a pocket is made with a straight router bit in the drill press. Note spacer strip. Below, single matching dovetail is made with molding head as in Fig. 4, except that stock is on edge



Above, after cutting pocket with straight router bit, job is finished with 1/2-in. dovetail router bit. Nail is used as stop in both operations. Below, in the finished joint dovetail should be snug fit in the pocket

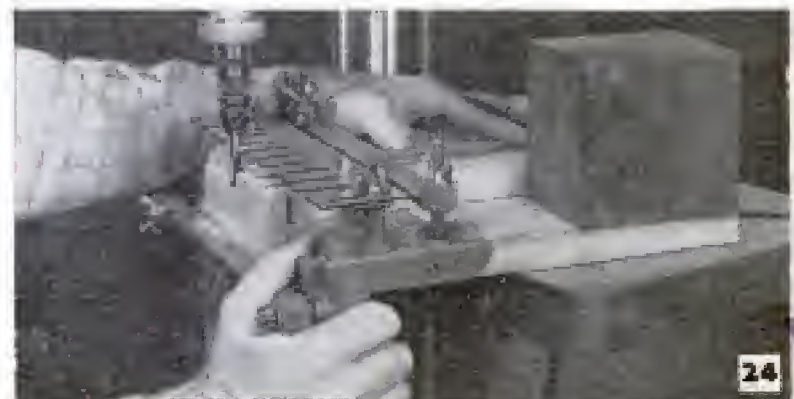




Multiple dovetails, such as used in drawer construction are the easiest of all to cut with the aid of the dovetailing jig shown

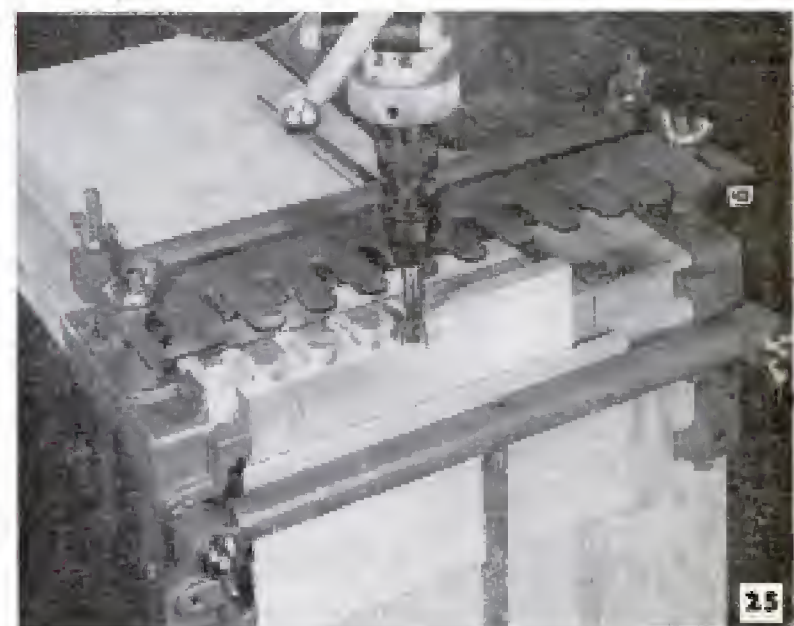
used to join top rails to legs or panels in cabinet construction. This type of joinery was much favored by older cabinetmakers. Fig. 20 pictures a typical example. Usually it is best to cut the socket, or pocket, first. This is first cut square as in Fig. 17, using a 1/4-in. square-nosed router bit. Use a spacer strip for the run-in cuts. The width of the spacer should be equal to the width of the pocket minus 1/4 in. Then, using the same setup, a 1/2-in. dovetail bit will make the angular side cuts as in Fig. 18. The matching dovetail pin is made with the setup shown in Fig. 19. It is the same as that in Fig. 4, except that the cuts are made with the work on edge. Care must be taken to make an accurate layout.

Dovetail drawer joints: These are the easiest of all to cut as you use the dovetail jig pictured in Figs. 23, 24 and 25. When correctly set up this unit cuts the sockets and pins in one pass, a finger template, or comb, Fig. 22, guiding the bit for each cut. When the cuts are finished the parts join as in Fig. 21. No glue is used in the joint. Care must be taken when making the setup, Fig. 23. A weight, Fig. 24, helps to steady the sliding jig. Fig. 25 shows the completed cuts. ★ ★ ★



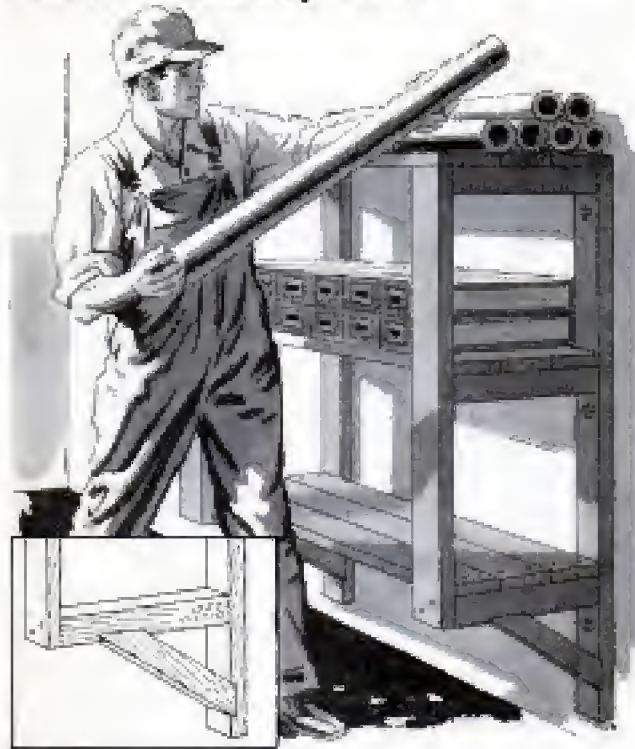
This is the jig assembled with two pieces of stock in place. In some cases a weight is needed to steady the sliding jig

The cut partially completed. Photo shows finger template which guides the dovetail bit. Joint is finished in one pass



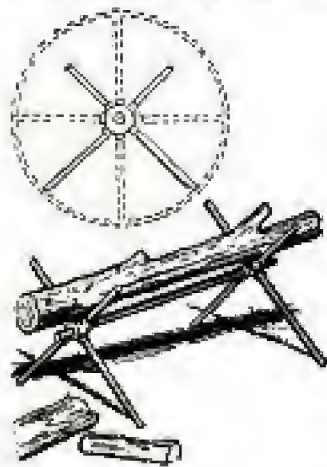
Leans, Bolback & Company

How to Mount Heavy Shelving Above Workshop Floor



In a garage or workshop where the floor is frequently swept or washed, a 45-deg. angle brace can be used to provide simple framing for heavy-duty shelving. As shown in the detail, the ends of the braces are mortised into both the vertical and horizontal pieces and fastened with lag screws. The vertical piece of the framing is lag-screwed to the wall studding. For most shelving, the braces should be spaced no more than 4 ft. apart.

Modified Implement Wheels Provide Sturdy Sawbuck



Two implement wheels, plus an axle or length of steel pipe, will provide a strong and easily made sawbuck. Cut off the rims and all but four of the spokes of each wheel as shown in the detail. Welding the pipe or axle to the hubs will make the sawbuck more rigid.

Soapstone on Straightedge Improves Acetylene Cuts

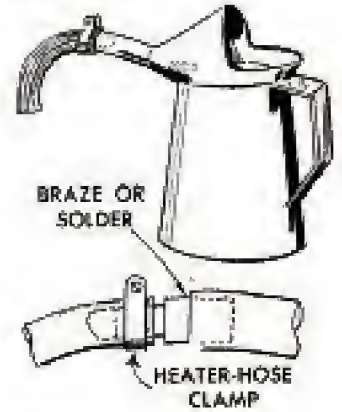
When cutting small parts by hand with an acetylene torch, using a straightedge as a guide, rub a heavy coating of soapstone

over the face of the straightedge on which the tip of the torch glides. This will prevent slag from sticking to the straightedge, thus avoiding work stoppages and increasing the speed with which work can be finished.

Claudie H. Sanders, Portland, Ore.

Automatic Transmissions Filled With Modified Oil Measure

A regular 1-qt. oil measure can be modified to overcome the difficulty of reaching the filler tube on automatic transmissions, which on most cars is located down low and to the rear of the engine compartment. Braze or solder a pipe



nipple to the spout of the oil measure, first grinding the pipe to a size that will slip inside an 18-in. length of $\frac{3}{4}$ -in. o.d. rubber hose. Fasten the hose to the nipple with a regular automobile-heater-hose clamp.

Phil McCafferty, Fort Bliss, Tex.

Bearings Used as Bushings

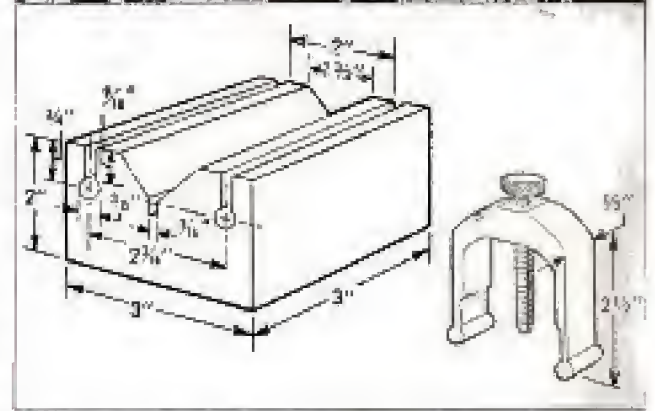
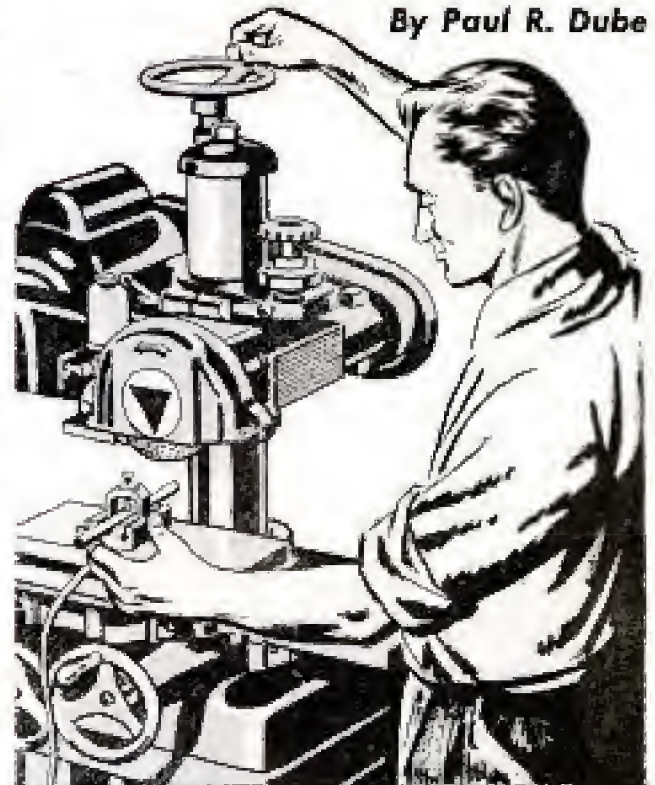
Bronze electric-motor bearings make ideal reducing bushings for adapting pulleys with a large i.d. to fit a smaller shaft. The bushings have various wall thicknesses, such as $\frac{1}{2} \times \frac{3}{8}$ in. and $\frac{1}{2} \times \frac{3}{4}$ in., allowing a considerable range of sizes. By lining up the oil slot with the setscrew on the pulley, a tight, positive fit is assured.—Ralph E. Moore, Wenatchee, Wash.



Improved V-Block Has Five Working Surfaces

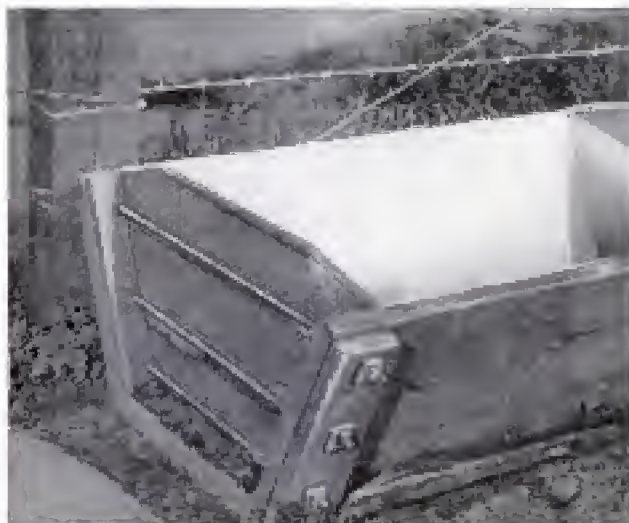
By Paul R. Dube

Ordinary V-blocks used by machinists and toolmakers are limited in machineable and surface-plate applications due to the external clamp. At most, only three surfaces are usable, the bottom and the two ends. The clamp prevents use of the block on either of the two sides. The V-block detailed at the right provides five working surfaces, all square with those adjacent. The opposite sides and ends are ground parallel. A special clamp slides internally, the two arms fitting into parallel slots milled one on each side of the vee and equidistant from the center line of the block. The slots are made by drilling holes through the block lengthwise, then milling grooves to the holes. The arms of the clamp are shaped as indicated with rounded ends milled and ground to a true radius and sized to fit in the slots with sufficient clearance for easy insertion and removal. Dimensions of the block can be altered to suit individual requirements but proportions should be kept reasonably close to those indicated. An oil-hardening steel is used for the block. After the machining is done the block is hardened, quenched in oil and the temper drawn to a blue color. After hardening, all dimensions must be checked and the block re-ground if necessary. The clamp can be made deeper if desired. Some machinists prefer to break all corners on the block $\frac{1}{8}$ in. for ease in handling. This prevents chipping and avoids any possibility of hand injury due to the sharp corners. Note that there is a $\frac{3}{16}$ -in. chip-clearance groove milled in the bottom of the vee.



Liner for Watering Trough Made From Sheet Aluminum

For an easily cleaned liner in a watering or feeding trough, use sheet aluminum, which will never rust, rot, mildew or de-

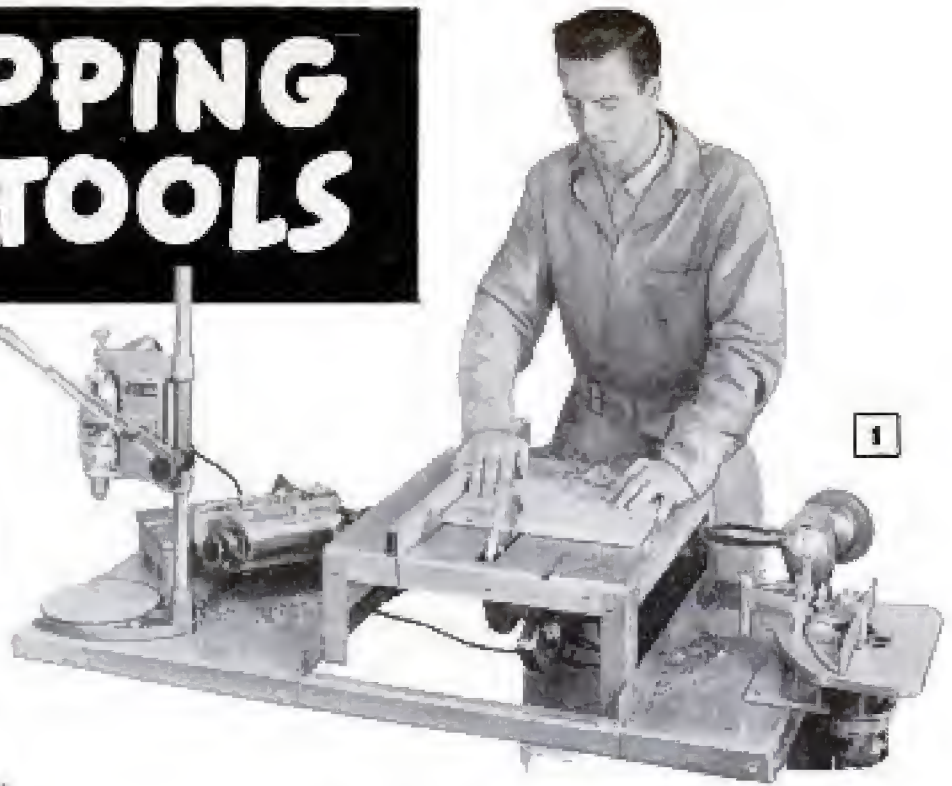


teriorate from exposure to weather. Supplied in several gauges and patterns, the metal can be worked easily with hand tools and is available now at most hardware stores. Be careful to see that the aluminum does not come in contact with steel at any point, as an electrolytic action will result, which destroys the aluminum in the area of contact. Use aluminum nails or screws to fasten sheet aluminum in place.

Edges of Masking Tape Sealed With Stitching Tool

To prevent paint from creeping under the edge of masking tape, due to the fact that the edges of the tape are not firmly in contact with the surface, use a vulcanizer's stitching tool or a wallpaper seam-roller along the edge of the tape. The tool will press edges of the tape down tightly.

SHOPPING FOR TOOLS

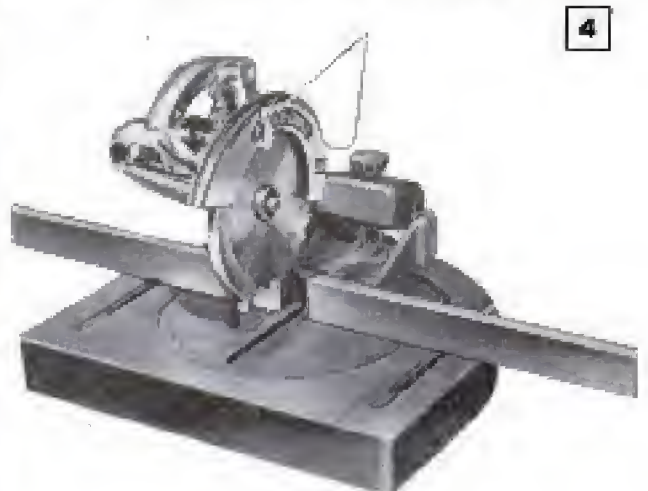
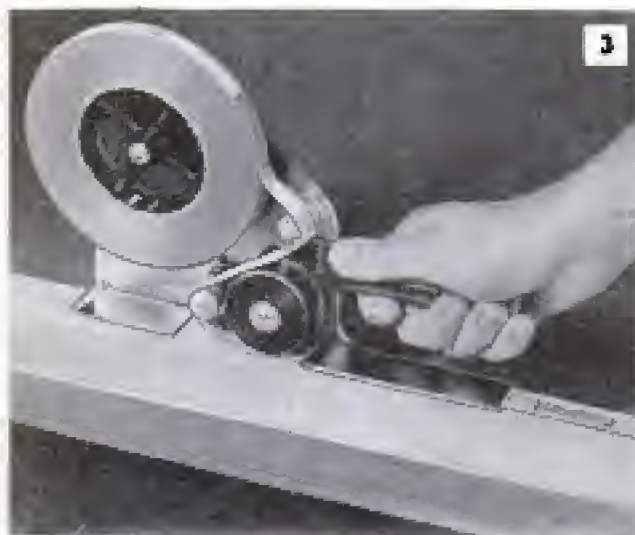


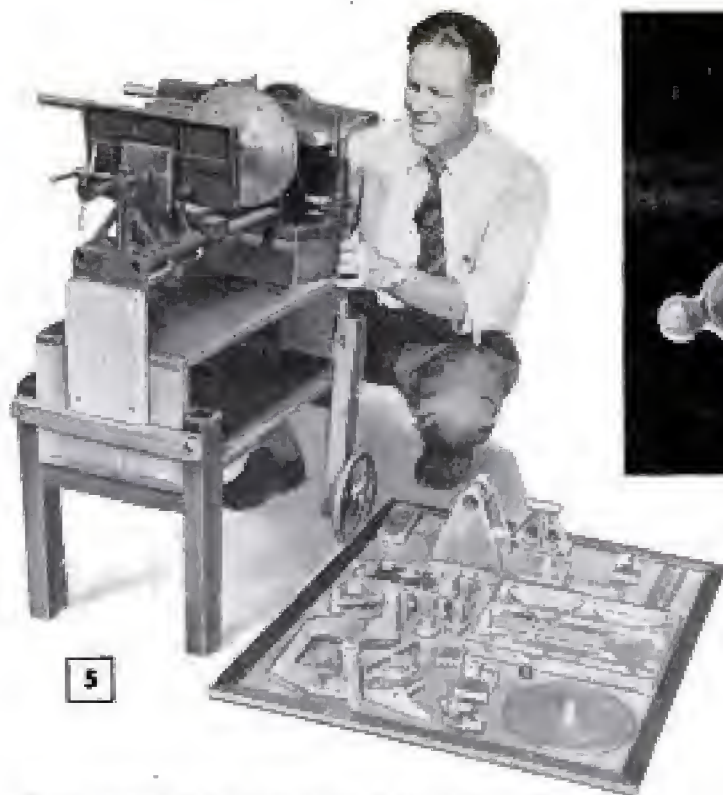
1. PORTABLE WORKSHOP consists of a stationary table and five portable power tools, each of which can be detached and used individually. Table provides space for mounting such portable electric tools as a drill, sander, circular saw, grinder and a router-shaper
Porter-Cable Machine Co., 31 Exchange St., Syracuse 3, N. Y.

2. COMBINATION VISE AND DRILL is arranged to attach to a truck bed or a bench with one bolt. Vise swivels through 360 deg. and can be detached from anvil base. Drill is clamped in vise jaws as pictured. Swings 11 in., is hand operated with pressure screw
Anchraut Knifed Co., Box 4001, Kalamazoo, Mich.

3. DISPOSABLE TAPE is marked on 16-in. centers so that when placed on the plate or sill, studs, joists and rafters are quickly and accurately spaced for nailing. Can be applied by hand or with the special dispenser pictured to effect an added saving in time
Minnesota Mining & Mfg. Co., 1000 Parkgate St., St. Paul 4, Minn.

4. CHOP SAW saves time when cutting a quantity of material to length, either square off or at an angle. Designed to mount an 8-in. electric handsaw with a special attachment for lifting the blade guard on the downstroke and lowering it on the upstroke
Dexter Page Co., 1527 E. 7th St., Los Angeles 23, Calif.





5. COMBINATION HOME-SHOP POWER TOOL can be built from the castings pictured. Assembled unit consists of saw, lathe, drill press, sander and grinder. Aluminum-castings kit comes complete with blueprints
 Mullerart Co., P.O. Box 6, Mt. San Antonio College Sta., Walnut, Calif.

6. NYLON HAMMER CAP fits standard ball-peen and claw hammers, making a "soft" hammer of either type for use on parts which must not be marred or broken by hammer blows. Available in five sizes
 Longco Automotive, Inc., Cleveland 27, Ohio

7. SHEET-METAL SAW is made like an ordinary carpenter's handsaw, except that it uses a standard narrow hacksaw blade with 32 teeth per in. for cutting thin sheet metal without buckling or binding
 James Neill & Co. (Sheffield), Ltd., Nether Street, Sheffield 11, England

8. FOLDING SAW for campers and woodsmen has a pivoted blade that folds into the wooden handle for carrying. Blade has 6 teeth to the inch. Unit is only 10 in. long when folded. Tang has eye for belt loop
 Swedesco, P.O. Box 465, Greenbush, Conn.

9. SPINDLE SHAPER in build-it-yourself kit comes with ball-bearing spindle mechanism assembled ready to mount under a wooden table. Kit includes shaper fence, screws and bolts and complete instructions
 Gilllow Power Tools, St. Louis 23, Mo.



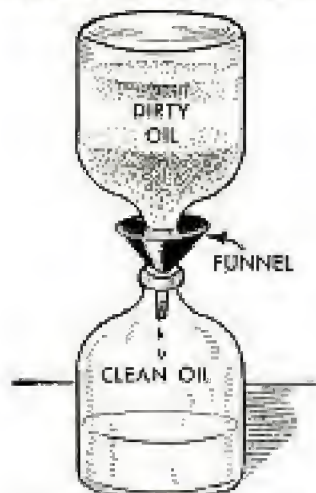
Low-Bed Cart Saves Labor When Lifting Milk Cans



To save labor in handling milk cans around his dairy barns, one farmer uses this three-wheel cart. Its low bed eases the labor of lifting filled cans, and the single rear wheel permits making sharp turns. Rubber tires allow the cart to roll over rough floors or ground with ease and reduce noise to a minimum.

John Krill, North Lima, Ohio.

Simple Filter for Liquids Utilizes Two Bottles



Ordinary drain oil will be filtered clean enough to be used to rustproof tools.

W. F. Schaphorst, Newark, N. J.

Graphite Aids in Removal Of Soldering-Iron Tip

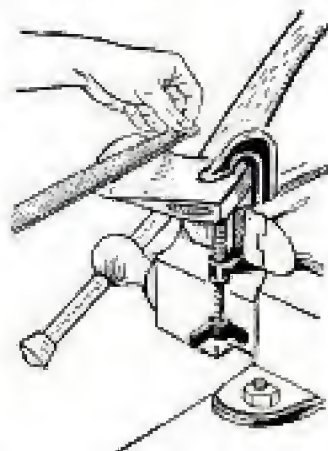
If the tip of an electric soldering iron is not removed occasionally, the threads will become oxidized and eventually seize. This makes removal difficult and, in some cases,

makes drilling of the tip necessary. Seizing of the tip can be prevented by rubbing a little powdered graphite into the threads before replacing it.

Harry J. Miller, Sarasota, Fla.

Ax Held by C-Clamp in Vise For Sharpening With File

To use a file effectively to sharpen an ax or hatchet, the blade should be held in a horizontal position. It can be done easily by using a C-clamp held in a vise, as shown. File against the edge of the blade to prevent a burr. — R. W. De Cesare, Vallejo, Calif.



Self-Filling Hog Waterer Made From Oil Drum

The hog waterer shown in the illustration was made by cutting an opening in the side of a 50-gal. oil drum. A float valve then was installed in the drum and a board placed in front of it to protect it. The hole in the drum is large enough to allow hogs to drink, but small enough to keep them from sticking their feet into the water.



☞ Silk lamp shades should be cleaned with dough wallpaper cleaner instead of a brush.

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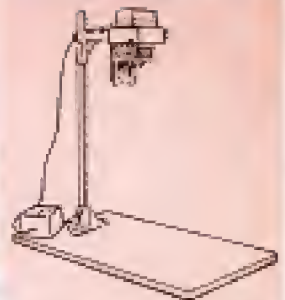
Camera fans! Here's an outfit that will enable you to take and make the best pictures you ever had! Think of it . . . you get a real press-type Century Graphic camera and a true precision enlarger for little more than you'd pay for the camera alone!

Your Century Graphic with the famous Grafmatic Sheet Film Holder, has the amazing versatility to conquer almost any photographic problem. The Graflarger, with its cold light illumination, sturdy, precision stand and handsome baseboard, is just what you need to make superb enlargements (up to 11 x 14) from your negatives. Here's a combination—at a price—that can't be beat! See your dealer today!

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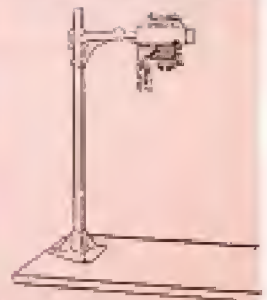
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2. GRAFMATIC SHEET FILM HOLDER.
3. GRAFLARGER COLD LIGHT BACK converts Century Graphic to a precision enlarger.
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5. Rigid, moisture-proofed, 18" x 30" baseboard.

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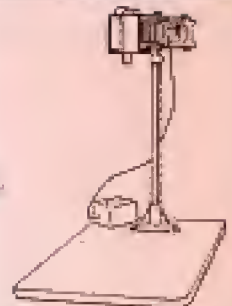
Used vertically, your Century Graphic-Graflarger gives enlargements up to 11" x 14".

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Used horizontally, your Century Graphic-Graflarger may be used for making big enlargements or murals.

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—watching your first photo
appear out of nowhere

Now it's so easy to print your own snapshots!
You can do it with the room lights on!

Watch a picture you've taken appear as if by magic on a blank sheet of paper in the developing tray. We wager you'll get the thrill of a lifetime!

It's all so easy with the Kodak Velite Paper that's included in Kodacraft Outfits. You can print a picture in daylight or under any type of electric light ordinarily used in your home.

The pictures below show how really simple it all is. *As little as \$5.25 can start you off.* Your best friend to see is your Kodak dealer.



Kodacraft Photo Developing and Printing Outfits

are designed for ease of use, contain all basic equipment. Kodacraft Printing Kit, \$5.25; Kodacraft Photo-Lab Outfit (illustrated), \$9.75; Kodacraft Advanced Photo-Lab, \$14.95.



Expose 20 secs. Place negative and Velite Paper in printing frame and expose with 100-watt bulb in reflector of gooseneck desk lamp at 8 inches.



Develop 60 secs. Remove Velite Paper and place in developer. Rock tray gently. Picture will appear in about 60 seconds. You'll scarcely believe your eyes.

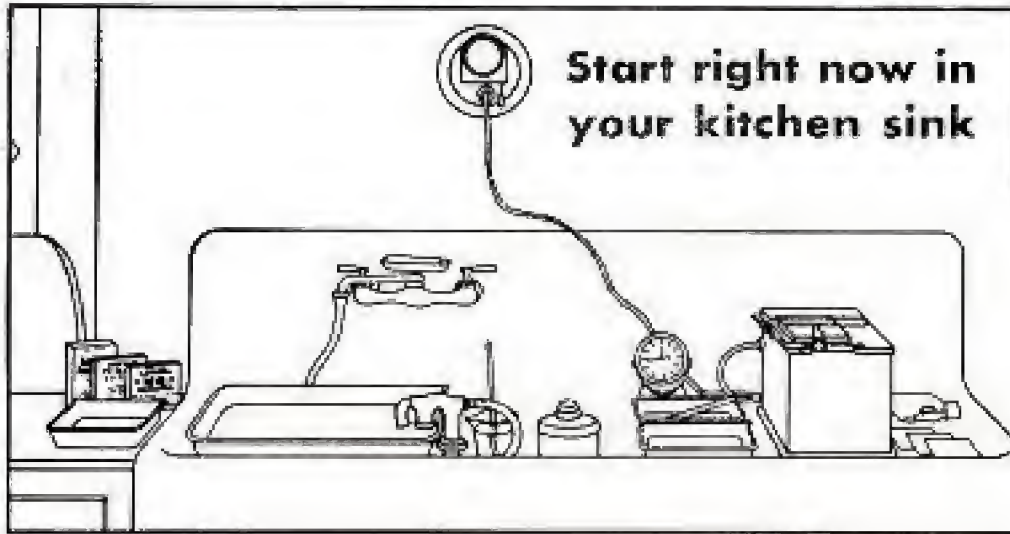


Use stop bath 15 secs. Next drop into stop bath and agitate 15 secs. (Isn't this an easy way to make extra prints for friends—or personal photogreeting cards.)



Place in fixer. Take print from stop bath and place in fixing bath. Soak for 5-10 minutes. Wash in running water—then dry in blotter.

No elaborate equipment needed to become expert at this hobby



Once you've enjoyed the thrill of printing your own photos and gained some experience, you'll want to develop your own film—and eventually make big, dramatic *enlargements*.

The modestly priced Kodacraft Photo-Lab Outfits have everything you need to start off. Later on, as you advance, you'll want to add such pieces of Kodak equipment as are shown below. Equipment arrangement should allow a smooth flow of work from printing frame through de-

veloper, stop bath, fixing, and washing with everything compactly grouped so operations can be performed with a minimum of steps. If there's no lamp socket over the sink, safelight can be placed on extension cord.

Your Kodak dealer can give you valuable help on this project. Among the literature available is the booklet, "Developing, Printing and Enlarging," which you'll find extremely useful. Why not see him before the weekend?



Time-saving print dryer. Kodak Photo Blotter Roll prevents prints from curling. \$2.88



Handy combination funnel. Kodak Combination Funnel provides 3 sizes of funnels. \$1.85



Low-cost timer. Kodak Timer (with split-second hands) can be restarted without resetting. \$7.95



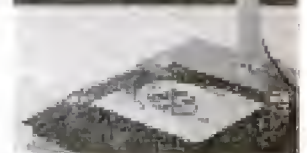
Automatic print-washing. Kodak Automatic Tray Siphon attaches to water faucet. \$4.50



2-way safelamp. For enlarging, black-out kitchen window—use Kodak 2-way Safelamp. \$4.50

Popular-priced enlarger complete with lens. Kodak Hobbyist takes negatives up to $2\frac{1}{4} \times 3\frac{1}{4}$ inches. "Cold-light" protects negatives. New-type, easy loading. \$57.50

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Care and Feeding of Engines



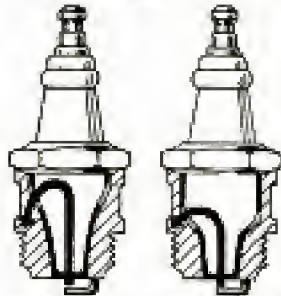
BY
S. P. CORP

SPARK PLUG CARE

When tuning up, be sure to sand-blast electrodes and porcelain on all plugs, to remove metallic oxide coating. Then inspect threads to make sure they are sharp and not rounded off. Rounded threads will not form a good seal with threads of the cylinder head, and will cause loss of power. Take an old plug, with good sharp threads, and cut a groove through the threads with a 3-cornered file. Use this plug as a die to cut the carbon from the threads in the cylinder head. Then remove plug and clean cylinder head threads with compressed air before installing new plug. Such carbon causes poor plug performance by restricting heat transfer, and can cause a compression leak.



FILE NOTCH
IN THREADS



HOT PLUG LONG INSULATOR
COLD PLUG SHORT INSULATOR

Individual engines operate under varying conditions. If an engine runs cool, a hotter plug will increase operating efficiency. Such a plug has a longer white insulator and retains heat to burn oil vapor that may get past valve guides, in worn engines. Do not use a hot plug in an engine with good compression. Cool plugs, with very short insulators, should be used only if engine operates under very hot running conditions. Be sure your new plugs have sharp threads to make a good seal in the cylinder head.

DOES YOUR STARTER JAM?

Then get a starter wrench. Remove live wire from battery, hot wire from starter, and use starter wrench to remove starter from engine. Clean screw drive and pinion with kerosene (not gasoline!) and check pinion spring for possible damage. Lubricate drive screw and pinion with engine oil. Make sure armature shaft is not bent; see that drive spring screws are tight. Then remove any burrs from teeth of starter ring gear, as these could cause starter pinion to jam.

VALUABLE MANUAL FREE!



When you re-ring, give your engine the heat-fighting, friction-fighting endurance of the finest in chrome rings—KromeX Ring Sets! Millions of road miles have proved their superiority. Write for the free illustrated manual, "MORE POWER, Less Gas, Less Oil," which may save you a lot of money. Address Sealed Power, Dept. G-11, Muskegon, Michigan.

Sealed Power

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Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Damp Basement



Q—My problem is a damp basement. The walls are of poured concrete. The house is about two years old. There are drops of water on the walls nearly all the time. I thought this was condensation, but I have noticed that it seems to be a continuing condition regardless of temperature changes. What is the cause?

—M.R., N. Y.

A—Your description would indicate that the trouble is caused by a static head of water rather than condensation. Also it would indicate that the wall was not properly waterproofed at the time the house was built, as otherwise water would not pass through the wall from the outside. Sometimes an underground spring is the cause but more often it is due to water flowing from a higher to a lower level where it collects in quantity below grade. Under these conditions the water becomes trapped somewhere at a lower level and considerable hydrostatic pressure is built up, especially where poor-drainage conditions exist. This may happen only occasionally as there may be sufficient drainage to carry away the water over a period of time. It is possible that coating the inside surface of the walls with a masonry waterproofer would turn the trick, but we are inclined to be rather doubtful. However, a trial would not be expensive. We'd recommend it as the first step. If it proves unsuccessful, then the only alternatives are laying a drain tile or digging down along the walls to the footings and waterproofing the walls with hot asphalt.

Finish Bleeds



Q—The woodwork in my home was originally stained a dark color, what I presume was called mission oak. Recently I sanded the woodwork and applied a light-green semigloss finish to match the walls. Only a part of the woodwork is finished and I have lately noticed that the stain seems to be bleeding through in spots. Is there anything I can do to prevent this?—B.E., Iowa

(Continued to page 226)

Texaco



Tips on car care



How to keep your windshield from freezing over

Freezing rain, sleet or snow on your windshield is one of winter's worst driving hazards and can cause serious accidents. Good way to prevent freezing is to rub a thin film of glycerin on the windshield with a cloth. Be sure to wash off the glycerin film after the storm because it tends to collect road dirt.

How to get that "cushiony" ride

Turn all your driving miles into pleasure miles. Keep your car's chassis protected with Marfak. This tough, elastic lubricant clings to vital points of friction longer (note the "collar" of Marfak guarding the universal joint). Marfak resists squeeze-out, jar-out and wash-out, too. In your car, this means one thousand miles or more of cushiony, smooth riding. Drive in for longer lasting Marfak lubrication. See your Texaco Dealer . . . the best friend your car has ever had.



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EASILY APPLIED Weldtex exterior paneling harmonizes with any architectural design, takes stain or paint beautifully. Panels 4' x 8' cost 33¢ a sq. ft.

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Weldwood Building, 55 W. 44th St., New York 36, N. Y.
and U. S.-Mangel Plywoods, Inc., Louisville, Kentucky

(Continued from page 224)

A—You did not say whether or not you applied an undercoater under the new finish. This is usually recommended when painting or enameling old woodwork, especially that which has been finished in a dark color. As a rule you can rely on the undercoater to prevent bleeding of the darker color. Sometimes it is necessary or advisable to remove the old finish back to the bare wood. In your case, we would suggest that you select a door or window trim in an inconspicuous place, apply an undercoater and a coat of top finish in the color desired and note the results before going any further with finishing the remainder of the woodwork. If no discoloration shows after a week or so it probably is safe to proceed. On the woodwork already finished and which is showing discoloration, it likely is best to remove the defective finish with a paint remover and begin over again, using an undercoater as the first application. However, we would await results of the test before going ahead with the job. It is likely you will experience no further trouble after using the undercoat.



Seep Drains

Q—I'm having trouble with the drainage field from a septic tank. Apparently the difficulty is simply the lack of ample drainage area within the boundaries of my property as the natural drainage should be reasonably good. Would the installation of dry wells solve the problem? Or can you suggest any other method or type of installation?—F.D., Ill.

A—Assuming that you have rightly stated the cause of the trouble and that the tank itself is of the recommended size and construction, it is just possible that the installation of dry wells would remedy the condition. Without knowing more about the possible causes of the condition as it now exists it would be impossible to say definitely. The wells might effect a temporary cure but we are inclined to be doubtful if it would be permanent as it is possible that the dry wells would not handle the effluent in sufficient volume after a time as they tend to fill with soil and sand. There is one other possible solution, the use of metal seepage wells. These can be installed singly or in a series along one drain tile, and are said to be quite effective on systems installed where drainage conditions are inadequate. The wells are of metal, asphalt-coated and perforated. They are rectangular in shape, are closed on the four sides and the top and come in two sizes. The units are installed below grade in large holes and the inlet and outlet tiles enter holes in the sides near the top of each unit. After installing the unit, the space around each unit is filled with medium to coarse gravel.

Repairing Concrete Step

Q—I want to repair a concrete step which has chipped to a depth of about 1 1/2 in. The loose portion is about 12 in. long and can be lifted out, leaving a shallow depression. Is there any material, cement or other adhesive, which can be used to reinstall this piece? If not, what other method should I use?—V.J., Calif.

A—We could not recommend that you attempt to replace the damaged portion as you suggest. Such a repair is rarely satisfactory or reliable over a period of time. We think it better to remove the loose concrete, then cut down to a depth of about 1 in. at the feathered edges of the depression, using a cold chisel. This will form a rectangular recess with square edges. You did not say, but we assume the break extends to the edge of the step. This being the case, it will be necessary to place a retaining board, or form board, along the rise of the step, its top edge flush with the top of the step. Fill the recess with a cement-sand mixture and trowel smooth. After the mixture sets, remove the form board and cover with a dampened burlap bag or other coarse fabric. Keep the cover damp for at least a week.

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 as simple to run as a
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**8" CIRCLE
 SAW**

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What rugged
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Look at the big
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Now for the first time a power tool as simple to run as a modern appliance. Just plug it in! No motors to buy or mount! No V-belts or pulleys to worry about. Now, the most important tool for your home workshop is also the easiest to operate. Shopmaster's handy floor model 8" tilting arbor Circle Saw features a one-piece all-metal stand; has a specially built nationally famous motor that develops up to 3/4 h.p. torque—direct drive motor... Operates with no power loss! Note newly designed master view indicator with finger-tip control. Blade cuts 2 1/2" depth and tilts to a full 45°. Table size with extensions is 16" x 30". Comes complete with stand, saw, built-in motor, cord, mitre gauge, stop rods, rip fence, 8" Roc-edge blade, side extensions and plastic guard—nothing else to buy!

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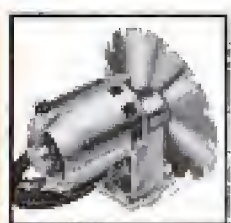
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TABLE MODEL
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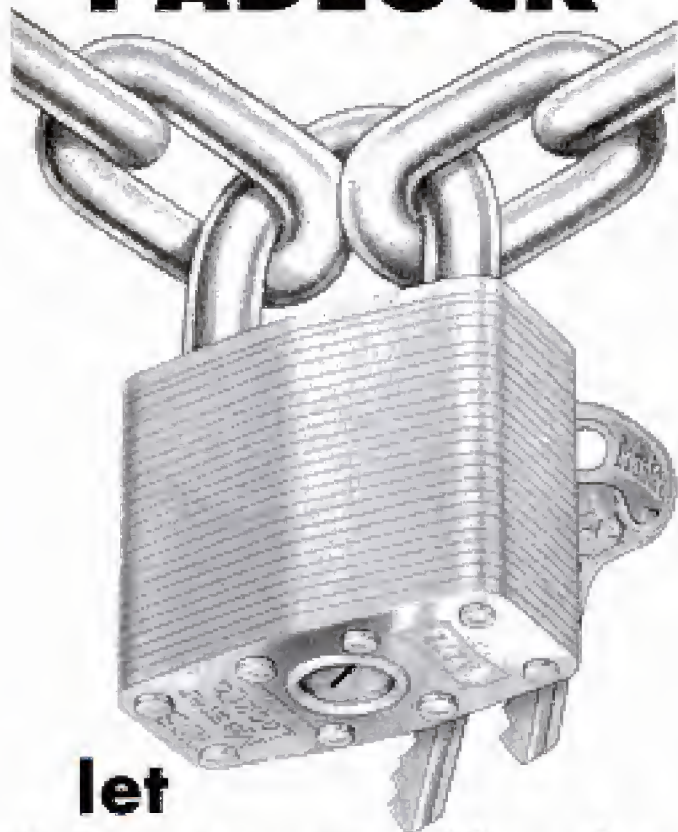
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How to Make Part-Time Farming Pay

(Continued from page 133)

a different room or another building. After they are six weeks old they are moved to the finishing batteries in another room or building where they are kept until ready for market. Keeping the different-age birds in separate rooms cuts the danger of respiratory diseases.

Almost any kind of building is suitable provided at least 10 feet of head room is available. In some cases old factory buildings, barns, garages and sheds have done as well as new buildings. Here are some of the advantages of the battery-brooder system over the floor method: A definite number of finished birds can be ready for market each week, heavier weights come more quickly, feed costs are slightly lower and, since from three to five times as many birds can be produced per square foot of floor space, the system is practical if the price of land is high or if the space available is limited.

There are these disadvantages: The investment per bird is higher; battery broilers must be slaughtered soon after removal from the battery (being soft-meated they shrink too much if shipped alive); there is a bigger danger of respiratory disease, disposal of droppings may be a problem and labor costs are higher since hand feeding must be used.

It is desirable to have a preferred retail market near by for birds weighing 2 to 2½ pounds that will absorb your weekly supply. Birds of this weight can be produced in eight or nine weeks, thus giving a faster turnover.

Another farm enterprise that has undergone drastic changes in the past few years is dairying. It is another instance where you don't grow into the business—you buy into it. Unless you are raising a house full of robust, milk-drinking youngsters it's quite likely you can buy your dairy products for less money than you can produce them for home consumption.

To make dairying as easy and as pleasant as possible, plan to use laborsaving equipment. It is doubtful if a 12 or 15-cow herd can be an efficient operation. Think in terms of 20 or 40—at least 20 cows for the family operation or 40 if additional labor is to be employed.

At present costs you can figure your total investment in cows, buildings, fencing and milking equipment (not including land) at about \$610 per cow. For a 20-cow dairy this would total about \$12,200. For

(Continued to page 230)

THE GREATEST INVENTION SINCE THE HAND SAW . . .

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\$229 delivered (saw blade and custom-built 1/2 H. P. motor included). **EASY TERMS.**

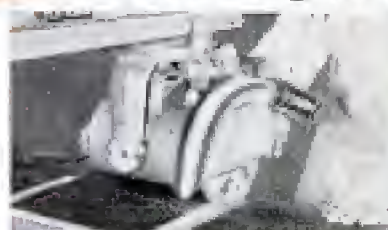
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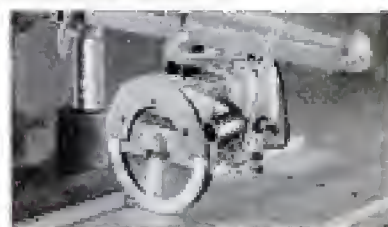
EASY TO USE! You control ball-bearing travel head in radial arm. Moves smoothly, precisely. All cuts perfect—no spallage.



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Flow on wall paint in an even coat...



Pointers on painting interior walls: wash old paint with detergent, wipe clean, let it dry thoroughly. Paint with sweeping, fanning strokes to 4-inch brush is the most popular size. Paint in narrow strips from ceiling to baseboard. Work back towards wet areas to avoid lap marks. And always . . .

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You'll do faster, better-looking work inside or outside your home when you use brushes with "Tynex" bristles.

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Look for **TYNEX** nylon bristles
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land requirements, figure on one acre per cow for grazing on planted pasture and another acre in permanent pasture. You will need to raise or buy six tons of silage and two tons of hay per cow.

Roughly, you can figure cows at \$300 each, Grade A milking barn at \$1500, feeding barns, sheds and feed storage \$2500, fencing \$500, water system \$550 and equipment for dairy barn and milk room \$1200.

A new trend in dairying is pickup by insulated milk tank trucks. This eliminates the milk can and saves labor. Milk is piped directly from the milking machine into the cold-wall tank which holds the milk at low temperature until the truck picks it up.

Small fruit farms can be profitable where spray machinery, tractors and orchard cultivators have reduced the cost of growing fruit. For most efficient use of this equipment there are minimum acreages that will justify the investment. Harry Morris, working with peaches for the Texas Agricultural Experiment Station says that 30 acres is about the minimum for a peach orchard mechanized for most operations.

Vegetable growing is becoming more highly mechanized every year. It is the one farm enterprise in which you can start small and grow as big as you wish. Small garden tractors mechanize truck farming even on a part of an acre. The kind of truck crops you grow may determine the size of operations. An acre of pole beans, for example, will require as much cultural labor as five acres of cabbage.

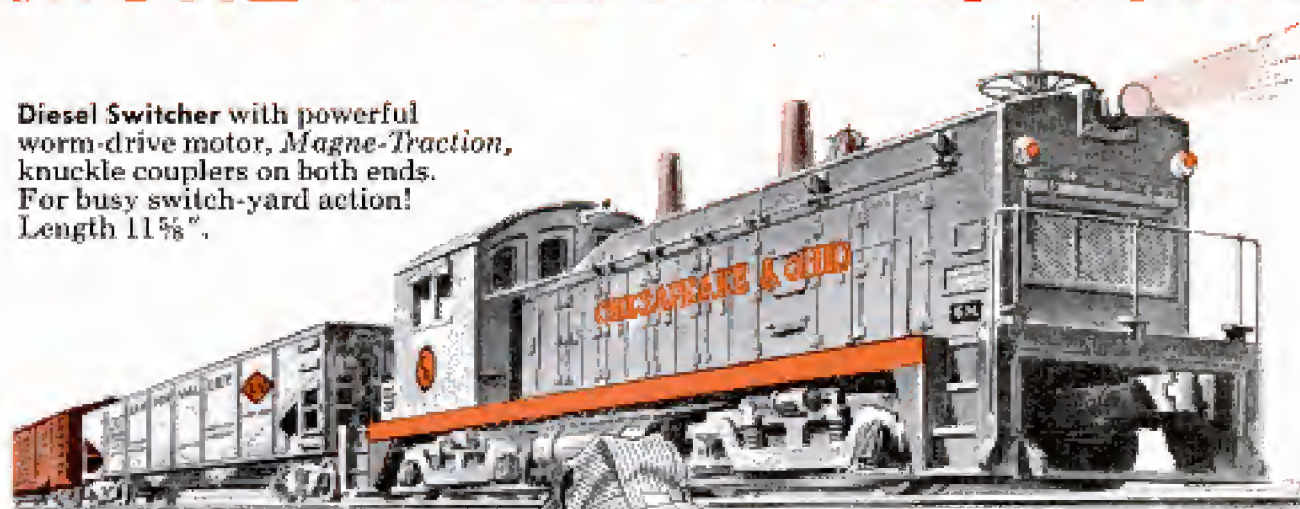
The competition is keen when you go to market with your produce, but if you have a good retail outlet your chances of success are good. Some areas of the country blessed with mild climate, fertile soil and cheap labor can grow vegetables and flood the market with produce cheaper than it can be produced anywhere else. Onions at 50 cents for a 50-pound bag, cabbage at \$12 a ton, and tomatoes at \$30 a ton point up the periodic marketing problems in some of these areas. The small, part-time grower must have a select market for extra-quality produce to compete with them.

Spraying and dusting equipment are musts for the truck grower. Make them power-driven to save labor, but remember it takes more acres to support the overhead. More consumers want their vegetables prepackaged and this may involve an additional outlay.

There are still many part-time farmers who do all of their chores by hand, chores that can be done at a mighty cheap price by electricity and gasoline engines. Human muscles can't compete with them. But it takes a lot of volume to make machines pay off.

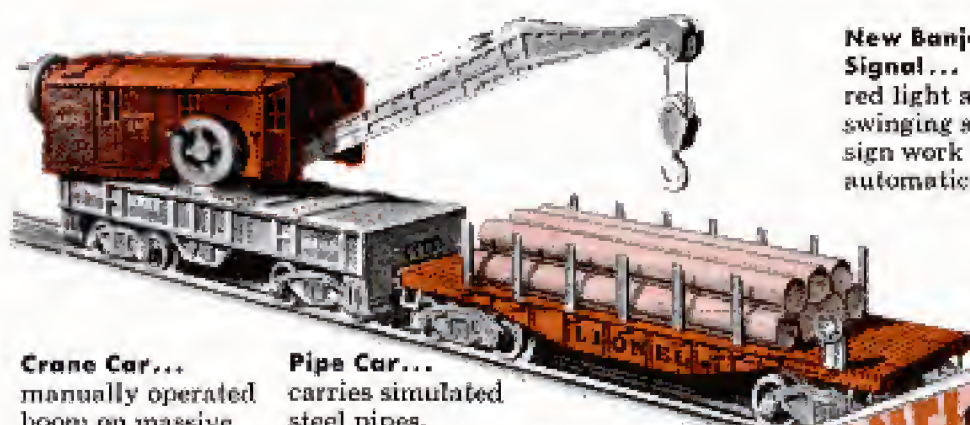
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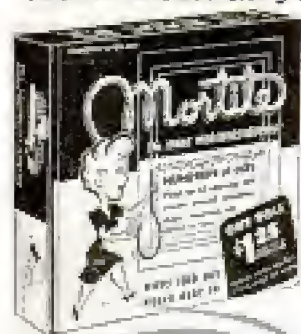
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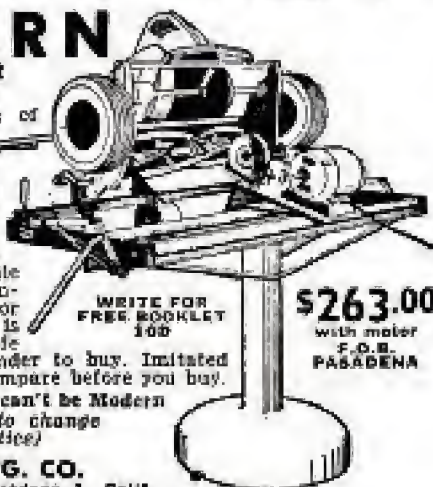
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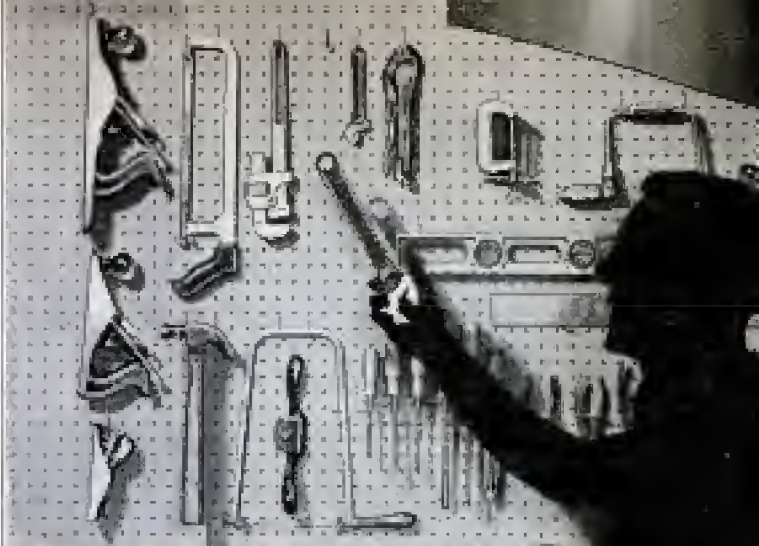
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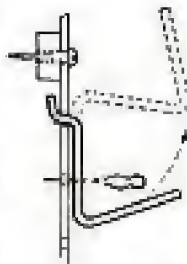
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238



Your tools
are handier and
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Fixtures slide
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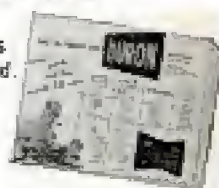
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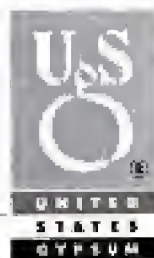
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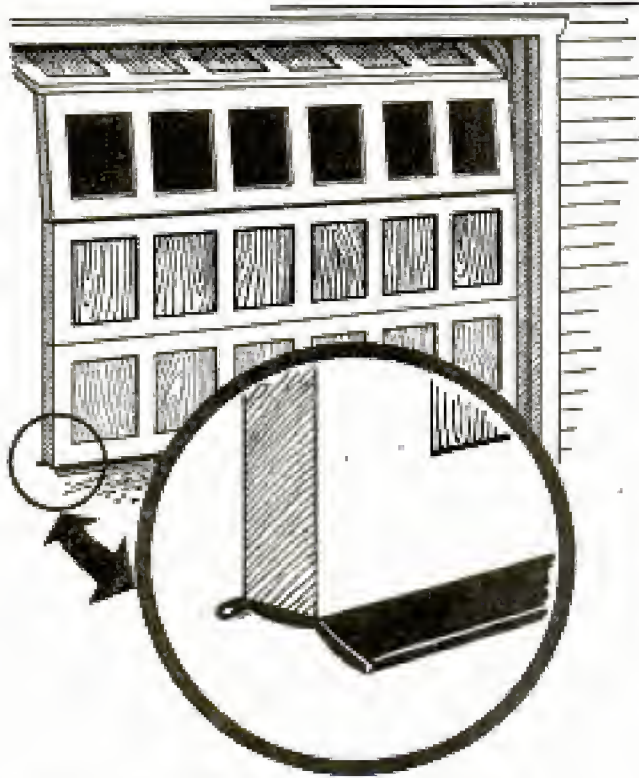
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Taxi Up Misery Mountain

(Continued from page 153)

Sno-Cat, Phil fell into a sideslip at the vicious Cragway turn. The 'Cat was an improved model that had been tried out in Alaska, disassembled and flown to New Hampshire. But all four of its crawler "pontoons" were helpless as Phil tried feverishly to get some grip that would stop the 3½ tons in its sideways slide down the mountain.

Finally, after 150 feet, the ground leveled off slightly and a bumper of snow packed against boulders brought the crawler to a stop. Phil continued to drive the 12-passenger 'Cat, but never again under such breath-taking circumstances. Since then, using his welding ability, he's tacked in bars that tighten the tracks. He's rebuilt the fifth wheels in the pontoons so that they can take more punishment when they slam down on the rocks.

Although heavy freight is usually trucked up the mountain before winter sets in, special deliveries are sometimes necessary. Once a two-ton jet had to be rushed up for icing tests. Phil delivered it on a sled he built and skidded up the curving road behind his bulldozer.

His transport system has no regular timetable because so much depends upon the weather and his sound judgment.

It was an almost balmy day down below the morning I rode with him on the Sno-Cat. But we learned from a telephone call to Walter J. Wallis, the company's resident engineer, that the temperature at the top was 10 degrees below zero and the wind was 65 miles per hour.

Phil figured it would be an unpleasant but not dangerous journey. As usual, he was right, and we made the eight miles in two hours. That's about par for a Sno-Cat.

A Weasel is faster, but can't always be used. Smaller than a Sno-Cat, it has just one pair of tracks and can scoot up the mountain like a souped-up crawler tractor in 50 minutes. That's only twice the time taken by a Jeep. The Weasel prefers running over packed snow, and stays home when snow is too deep or the winter route is too icy or steep.

Even the Sno-Cat, which can handle moderate side slants and with which we went up 32-degree grades, has its limits.

That's when Phil goes back to bulldozing. Rocking a 'dozer back and forth, he can crush ice and pack snowdrifts. Heavy drifts that slant across the road are chopped down and leveled so that the Sno-Cat can get through. Together with his assistant,

(Continued to page 236)

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useful all year 'round. Each kit includes:

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"Right here, in the book that came with your car,* it says—

Change your Oil Filter every 5,000 miles"

*17 out of 18 leading car makers recommend oil filter changes at least every 5,000 miles, on the average, depending on driving conditions.

Grit and sludge in the oil stream can damage delicate engine parts . . . run up expensive repair bills. Protect your engine by putting in new Purolator Oil Filter Refills regularly.

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"There's a Purolator engineered for every make of car," says Mr. Short. "We use them for all the cars we service."

MONEY-SAVING RULE: Check your Oil Filter every time you change your oil

*Purolator, "Micronic" Reg. U.S. Pat. Off. Purolator Products, Inc., Rahway, N.J.; Toronto, Canada.

Morris Parent, Phil not only has to drive the road, but keep it open too.

The end of the route is at the very top of the mountain, where the laboratory's headquarters for the activities of about 40 men is located. Here also is the transmitting station of WMTW, a newly opened TV station that covers much of New England.

Next door is the famed Mount Washington Observatory building where about four men keep track of the wild weather. It's here that a record 231-mile-per-hour wind was noted. Winds of 75 miles per hour are ordinary, since they occur on an average of every other day through four months of the year. The general rule up top is that at 80 miles per hour you don't trust your feet, but crawl. At over 125 miles per hour, you stay indoors.

Misery Mountain's breeziness causes Phil to warn new passengers getting out of a Sno-Cat: "Hold onto the door—with both hands."

With Parent, he has to clear the road and service vehicles that include three 'dozers, four Weasels and two Sno-Cats. Up top, he has another assistant, Martin Landry, who helps with maintenance jobs, like heating buildings and running the four diesel power generators. Like the 'dozers, they feed on kerosene hauled up in summer. The lighter fuel is preferred because of the intense cold.

One of Phil's more rugged jobs is to build and repair the telephone line down the mountain. That's part of his job of linking the men perched on top with civilization.

Three years ago Phil started using what's called the Winter Cutoff route. It's a short cut one mile long that leaves the section known as The Horn, which is 4½ miles up, and rejoins it at Mile 6¼. Thus, it saves almost a mile, but its main advantage is that it bypasses some devilish icing and drifting spots on the main road.

But a journey on the cutoff isn't exactly a pleasure trip. It means Phil has to teeter along the edge of the Great Gulf, a 1500-foot chasm that's a mile wide and two miles long. The first winter when a Sno-Cat was being tried here by someone else, its four clawing pontoons lost their grip and it went into a 200-foot slide. Luckily, it was head-on down the route, and not sideways into the Gulf.

Another winter, five years ago, Phil went down into the Gulf, but on foot. It was a dirty March day. George Nichols, one of the crew at the summit, had received word of his father's death, and left immediately on foot, expecting that Phil would come along in his Weasel soon and pick him up.

Phil left the summit five minutes later.

(Continued to page 234)



STAPLING SAVES 66%, STOPS SAG! You're looking at a big-selling feature of a well-known storm-and-screen door. It's the strong, continuous hinge secured by *staples* to aluminum frames. Until recently, self-tapping screws held three 2-inch hinges. In time, screws worked loose. Doors sagged.

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How much can you save by swinging over to Bostitch stapling?

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- preparing cartons for filling
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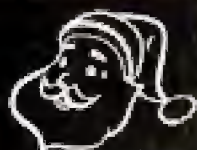
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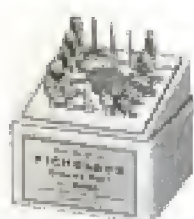
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4-IN-HAND (upper) is a file-rasp that gives you a choice of four different material-removing faces: Half Round file and Half Round rasp on one side, Flat file and Flat rasp on the other. For wood, metal, leather, plastics, etc.

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Amateur and professional craftsmen who pride themselves on a representative collection of fine tools invariably prefer Nicholson or Black Diamond when it comes to files. *Hardware dealers are equally proud to sell them.*

Two "musts" for the make-it-yourself hobbyist



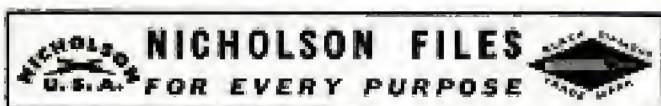
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NICHOLSON FILE CO., 22 Acorn St., Providence 1, R. I.
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The fog was so thick that he couldn't see ahead. He had to open his door and look straight down for previous tracks to follow. After a half mile, he gave up and went on by foot.

A mile farther, at Telegraph Hill's hair-pin turn, he saw Nichols' tracks take off to the left. Phil hoped it was just a short cut over what later became the Winter Cutoff. He kept on down to Halfway House, a relay point which is four miles up the mountain. It's just below the timber line.

He asked anxiously about Nichols. He hadn't come in. Phil phoned back to the summit for two rugged men to meet him at Mile 6½, and started back up the mountain with bare necessities stuffed in his back pack for men up at the summit—their mail and a case of canned milk.

He cached these when he met the other two men and they started trailing Nichols. Soon they were in snow up to their hips and the fog changed to drenching rain. To make it worse, the lost man had begun to circle as he dropped deeper into the chasm. At another spot, a bear's trail crossed his tracks.

It was seven hours before they found him floundering in the soaking, deep snow.

Going back would be impossible, so Phil led the party through the Gulf and six hours later had them safely at the Glen House below.

Even the Winter Cutoff can fill up as fast as bulldozers work to keep it open. On my trip up with Phil, I saw him peer ahead through wind-whipped snow, then mutter, "Talking of bad spots, here's one coming."

Rains had washed a wide gully in the mountainside at the spot we had to cross. The road had drifted deep.

Phil eased his 'Cat ahead, gently feeling his way. But snow piled ahead of him and he couldn't risk going into a skid. He rolled back, felt his way up the gully in a wide arc that brought him gently back to where the roadway should be, and clawed up the rise that took him out.

A few minutes later the rising wind was whipping fine snow into a blinding curtain ahead of us. Phil was driving with his door open so that he could follow his previous tracks.

"Suppose," I asked, "you can't see ahead and your tracks are too badly covered to see them?"

Phil chewed on that a second, then replied, "That's time to stay home."

When he looms in out of the storm up top, he's Mr. Popularity himself. Besides bringing mail, special parcels and equipment, he hauls up visitors and replacement

(Continued to page 240)

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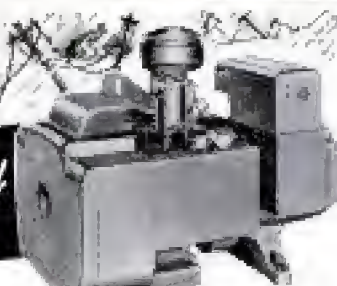


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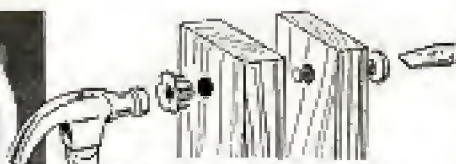
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personnel. Big Brass from Washington and leading scientists come to see the station. Relief crews are especially welcome. In winter, the men's schedule is 10 days on the mountain and 20 days off.

Getting off Misery Mountain is understandable. Why should anyone want to be on, anyway?

Its altitude—6288 feet—makes it the highest peak north of North Carolina and east of the Mississippi, but that alone is not why it's so rugged.

This barren summit is wide open to two great weather tracks—one swooping in from the St. Lawrence, the other up our East Coast. The result is Misery's turbulent refrigeration, and its weathermen have learned to expect 340 foggy days a year, with some frost and snow every month.

This makes it rugged for Phil Labbe, but just dandy for engineers trying to find cures for the icing that can crash a jet or vibrate a helicopter to pieces. On Mt. Washington, they can try out jet motors and captive helicopters under the dirtiest flying conditions, but with comparative safety and convenience.

Eventually all research will be housed in one building on which construction is well underway. It's a three-story affair of steel and concrete anchored deep into rock.

Sometimes in their bull sessions up top, the isolated engineers dream about a vehicular tunnel that would run up the mountain. Inside it, a conveyor system could haul freight and passengers. Some even envision it big enough to accommodate Jeeps.

But in the meantime, nobody's missing any rides with Phil's taxi service. And Phil isn't worrying about traffic cops or traffic congestion. The road's all his, when he can find it. ★ ★ ★

Switch Aids "Brain" Memory

Electronic brains are prevented from "forgetting" by a silicon-alloy junction diode that permits electricity to flow in only one direction. The tiny switch passes a minute charge of electricity to the plates of a condenser, where the stored charge represents one bit of information. By preventing the current from leaking backward, the diode prevents memory lapses. Tests have shown the leak through ordinary vacuum tube rectifiers to be up to 1000 times as great. An outgrowth of transistor research, the diode requires no warm-up time and will last indefinitely. It is about the size of a match head, and works thousands of times faster than its best mechanical counterparts.

No wonder it's called
"Miracle Vinyl-Flooring"!



MATICO ARISTOFLEX

RESISTS GREASE, ACID, ALKALI AND GRIME!

You'll call it "miracle flooring," too, when you see for yourself how rugged, durable MATICO Aristoflex shrugs off household acid, alkali and grease... stays new and sparkling looking with easy damp moppings. Biggest miracle of all is the price! Produced especially to meet the needs of homeowners everywhere, MATICO

Aristoflex is low in cost... gives you more for your money. And you can install economical Aristoflex in every room in your home... from basement to attic. See Aristoflex in 12 rich, clear colors at your MATICO dealer soon. You'll find him listed in your classified telephone directory.



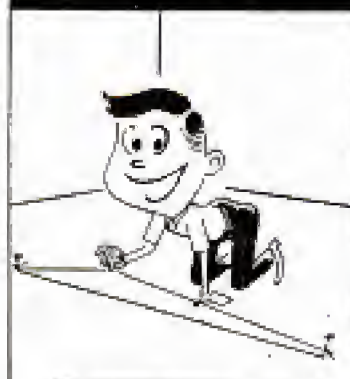
MASTIC TILE CORPORATION OF AMERICA

Joliet, Ill. • Long Beach, Calif. • Newburgh, N. Y.

Manufacturers of:

Aristoflex • Conletti • Parquetly • Asphalt Tile • Cork Tile • Plastic Wall Tile

INSTALL IT YOURSELF AND SAVE!



It's easy! Just mark a straight line through the center of your room in both directions, using a chalk and line. Be careful not to cover up your guide lines.



With a notched trowel, spread adhesive over one-half of your room at a time. Leave only a thin coat of adhesive on the floor.



After adhesive becomes tacky, snap the tiles into place. Do not slide tiles or adhesive will push up between the tiles.



Here's the best part! Show your wife your handiwork. (Don't tell her what a cinch it is with MATICO's easy-to-follow instructions).

Simplify your work with these

GOOD SHORT-CUTS

from

"Handy" SANDY



Need a disc sander? Your circular saw makes a dandy . . . If you substitute a disc cut from tempered hardboard for the saw blade, and attach one of my HANDY-SANDY Discs to it with a "peel-it-off" cement.

Or, if you have a wood lathe, the 6" face plate will work as a disc sander. Attach a 6 x 0 HANDY-SANDY Disc with pressure-sensitive adhesive or rubber cement. Turn the face plate at 500 to 1500 rpm for best results. Top-quality HANDY-SANDY Discs are available from your hardware or lumber dealer in four grit sizes: Fine, Medium, Coarse and Extra Coarse. Pays to keep an assortment on hand.

When repairing splintered or broken furniture, woodwork, etc., use FLEXBAC® Masking Tape by CARBORUNDUM to hold the pieces in place after gluing. When the glue has set, just peel the tape off.

Ever get a splinter when reaching in a drawer or pulling out a table leaf? You can avoid them by covering such "rough spots" with strips of FLEXBAC Masking Tape . . . It works better than any other type of tape because its made to hold fast to wood. Yet it peels off quickly, cleanly—whenever you want it to.

Plastic storm windows are easier to install, easier to remove—and stay weathertight longer — if you use FLEXBAC Masking Tape. Cut the plastic to size, run strips of tape along each edge, overlapping at the corners (let about two-thirds the width of the tape overhang the edge of the plastic on all sides). Then just press the storm window in place. No tacking . . . no cardboard strips necessary. Works on both wood and metal window frames. Buy FLEXBAC® Masking Tape by CARBORUNDUM from your favorite hardware dealer or lumber yard.

Strips of Flint Paper, glued grit side out to bottles containing anything "dangerous when taken internally" will alert you . . . specially when you're still half asleep, looking for a remedy in the middle of the night!

Remove soiled spots from anything with a natural wood finish by dipping a small sheet of Fine or Extra Fine Flint Paper by CARBORUNDUM in linseed oil (or a mixture of half linseed oil, half turpentine). Rub the soiled spot lightly until clean . . . won't injure the finish at all!

Write for free folder. "HOW TO SAND".

Address postcard to me —

"Handy" SANDY

CARBORUNDUM

Niagara Falls, New York

"CARBORUNDUM", "HANDY-SANDY" AND "FLEXBAC" ARE TRADEMARKS OF THE CARBORUNDUM COMPANY, NIAGARA FALLS, NEW YORK



Mechanical Arm Does Heavy Work In Radioactive Areas

Steel claws of the "world's largest mechanical arm" can thread a nut on a bolt or twist a heavy iron bar into the shape of a pretzel. The giant arm can operate drills, hammers and wrenches, assemble or disassemble machinery, lift 3000 pounds off the floor or carry 1000 pounds while extended horizontally. It can also pick up an egg or a laboratory beaker without cracking it. General Electric built the giant robot to substitute for human brawn in radioactive areas where men could not survive. It is remotely controlled from an instrument panel.

Guided-Missile-Flight Calculator

Musical messages from guided-missile instruments are radioed to earth and translated into charts and figures with equipment developed by Lockheed Aircraft. Transmitters squeezed into the missile broadcast messages fed to them by scores of delicate test instruments. Each instrument's reading is radioed as a sound closely resembling a violin note. Variations in pitch mean changes in instrument readings. From a master-recording tape, an electronic machine transposes high As into speed readings and F-sharps into heat, stress, steering information, engine performance or whatever the F-sharp represents. Readings come out as punched cards which are fed into an automatic plotter that charts the data as curves on a graph.

FRAMED IN FAME—
Safety-Engineered
UTILITY AXLES



MODEL 1-UCO, shown, features 1½" square axle of solid steel; 2500 lb. capacity. Comes completely equipped, except for tires. List price \$65.29, Fed. Ex. Tax included, F.O.B. Wausau. Other models to 5000 lb. capacity. We manufacture a complete line of trailer axles, couplers and jacks. Write for Brochure 15-K

HAMMER BLOW TOOL CO.

"As old as the industry!"
WAUSAU, WISCONSIN



CUT BUILDING COSTS 2/3!
Make Your Own Concrete
BLOCKS and BRICKS
To Use or Sell

New superior moulds make absolutely square, true, easy-to-lay blocks which will pass any building code. Production is fast . . . easy. One durable \$30 machine will make four 5"x8"x13" blocks per minute—1,000 a day. Pays for itself in one day! Sell blocks for big profit . . . or save 2% building cost for yourself. POST CARD BRINGS FREE FOLDER.

ECONOMY MFG. CO.
DEPT. P STONE MOUNTAIN, GA.

THE BEST IN PLIERS?

CHAN NEL LOCK

CHAMPION DEARMENT TOOL CO., MEADVILLE, PA.

SET-UP - KNOCKDOWN SAWHORSE with *Jiffy* BRACKETS



No nails or bolts . . . use 2x4's for legs. 2x4 or wider for crossbar. Rugged, sturdy, easy to move, saves storage space. Sold by hardware and building material dealers, or order direct.

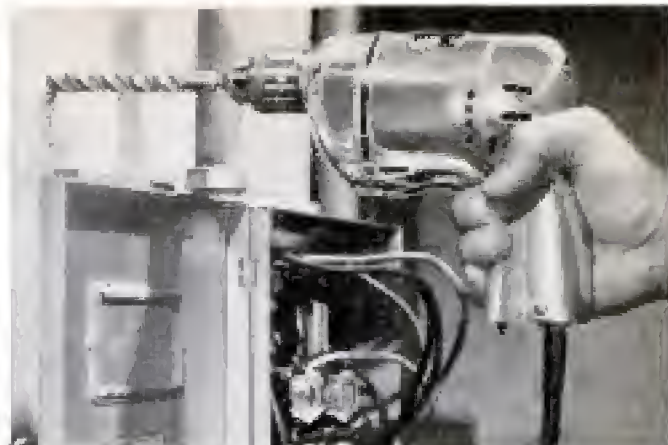
GRAND HAVEN STAMPED PRODUCTS CO., Grand Haven, Mich.



The Modern PLASTIC
for lasting Home Repairs

PERMANENTLY mends cracks or holes in wood, tile, stone or plaster. Sticks and stays put—Does not chip, shrink or fall out. Easy to use. Economical. Mold it, chisel it, polish or paint it. The big 4-lb. can is obtainable from your lumber, paint or hardware dealer at \$1.25; or will be shipped direct postpaid (in U. S.) for \$1.50. Complete satisfaction guaranteed or your money refunded.

DONALD DURHAM CO.
Box 804-T Des Moines, Iowa



Now—for tougher drilling jobs
NEW B&D 3/8" Utility Drill!



Only **\$38.95**

Here's a new drill, specially geared and powered for tougher-than-ordinary jobs! Its powerful B&D-built universal motor drives up to 3/8" diam. twist drills, 3/4" wood bits, 1/2" masonry bits, and 1 1/4" Hole Saws. Perfect for advanced craftsmen and light installation and service work. See your B&D dealer today!



Get this Complete 3/8" Utility Drill Kit—only \$64.95

Includes 3/8" Drill, 3 Hole Saws, 3 masonry bits, 3 wood augers and 8 twist drills in steel box with ample space for other items. Ideal for electricians, plumbers, carpenters, etc.

Bob Davis says: Send 25c in coin for my "Handy Tips" booklet, full of ideas and hints for home jobs. Write: Bob Davis, Home Service Dept. M-114, THE BLACK & DECKER MFG. CO., Towson 4, Maryland.



FOR INDUSTRY, SHOP, FARM AND HOME

Black & Decker
PORTABLE ELECTRIC TOOLS



Classified Telephone Directory tells where to buy it. For nearest dealer look under "Tools-Electric"

Save Money!

SAVE YOUR BRUSHES!



Now it's easy
to clean brushes

PAINT TRAP

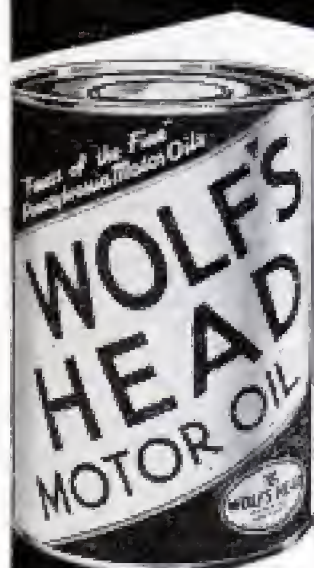
Reconditions old hard brushes
Thoroughly cleans after using

• Place brush in can of PAINT TRAP and work back and forth on the "Stay-Clean" Paint Trap. Emulsifying action washes away any paint, varnish or shellac. Old paint settles in paint trap—liquid can be used over and over. It's safe for all bristles. No fire hazard. Buy PAINT TRAP Brush Cleaner where you buy paint, or write:



The Klean-Strip Co., Inc.
2340 S. Lauderdale, Memphis 6, Tenn.

BEST WINTER PROTECTION



WOLF'S HEAD Motor Oil—100% Pure Pennsylvania—is specially refined from nature's finest crude. It provides rich, tough, long lasting lubrication in severe winter driving conditions. Scientifically fortified, it cleans as it lubricates . . . protects against sludge, rust, deposits. Be particular—change now to winter grade WOLF'S HEAD!

45¢
A QUART

Write for free
Weather Guide folder.

WOLF'S HEAD OIL REFINING CO., INC.
OIL CITY, PA.
GLENDALE 27, NEW YORK

Metropolitan Is a Good Thing In a Small Package, Say Owners

(Continued from page 122)

"I bought the car solely because of its eye appeal. It 'fits' me and suits my aesthetic taste."—Newburgh, N. Y., teacher.

"Rivals expensive sports cars for looks."—Myrtle Creek, Ore., department head.

"Bought it to travel back and forth to work, but found it rides so well now use it for all things."—West Hempstead, N. Y., foreman.

1954 NASH METROPOLITAN SPECIFICATIONS

ENGINE

Type 4-cyl., in-line, OHV
Bore and stroke 3.578 x 3.5 in.
Piston displacement 53.2 cu. in.
Brake horsepower 42 @ 4500 r.p.m.
Torque 89 @ 2400 r.p.m.
Compression ratio 7.2 to 1
Transmission Three-speed conventional

GENERAL

Steering ratio (over-all) 21:1
Steering wheel, lock-to-lock, 2 3/4 turns
Turn-disk diameter 40 feet
Brakes Hydraulic
Tire size 5.20 x 13
Recommended tire pressure, 39 lb. front, 22 lb. rear
Shipping weight (hardtop
unladen) 1325 lb.
Wheelbase 25 in.
Tread, front 45 5/16 in.
Tread, rear 44 13/16 in.
Height, over-all 54 1/8 in.
Width, over-all 61 1/2 in.
Length, over-all 149 1/8 in.
Road clearance 6 3/8 in.

CAPACITIES

Oil 4 qt.
Water 3 1/2 qt.
Gasoline 16 1/2 gal.

INTERIOR DIMENSIONS

Front-seat width 49 3/4 in.
Front headroom 35 1/2 in.
Front legroom 43 1/2 in.

"A pleasure to just joy ride again."—Portland, Ore., supervisor.

"Back seat excellent for my grandchildren. Seat is right height. Their feet touch floor and they can see out."—Scarsdale, N. Y., housewife.

Other Complaints of Owners

"Bad service. Dealers don't know how to fix things on this new design and don't like to work on it."—Chicago policeman.

"Lack of parts available. Windshield wipers poor. Ash tray too small."—Highland Park, Ill., broker.

"Would like larger, closed glove compartment or a side pocket in door."—N. Massapequa, N. Y., housewife.

"No cover on glove compartment. Can't remove ash tray to clean it."—Bayside, N. Y., advertising man.

"My wife is short and she has to look under steering-wheel rim. Seat too low."—Lacon, Ill., manager.

(Continued to page 246)



NEW MOPAR ANTIFREEZE

*OFFERS COMPLETE WINTER PROTECTION...
WITHOUT RUST, CORROSION, "GUMMING"!*

New MoPar All-Weather Antifreeze, made with special Chrysler Corporation formula, offers you these advantages:

1. Prevents decay of cooling system rubber parts.
2. Guards against rust which causes radiator clogging, pinhole leaks.
3. Minimizes "gum" deposits which can cause engine overheating.
4. Protects against corrosion of cooling system metals.

One filling (it won't boil off!)

assures worry-free driving all winter

New MoPar All-Weather Antifreeze gives 100% protection against freeze-ups—and will not boil off, foam off, or evaporate. And new MoPar All-Weather Antifreeze helps preserve top engine performance because it helps protect your cooling system against rust, corrosion, rubber decay, and "gum" deposits.

MoPar All-Weather Antifreeze is economical, too—it costs no more than ordinary permanent-type antifreeze. Get new MoPar All-Weather Antifreeze today from your nearby Plymouth, Dodge, De Soto, or Chrysler dealer, or from better service and repair shops everywhere.

MOPAR

... is more than just the name of top-quality antifreeze. It is the identifying name of thousands of genuine parts and accessories designed and built especially for your Plymouth, Dodge, De Soto, or Chrysler car, or Dodge "Job-Rated" truck.

PARTS DIVISION • CHRYSLER CORPORATION

NOW! SLASH HEAT BILLS



with Amazing new Gold Bond TWINSULATION

You cut your heating bills immediately when you insulate your attic with new Gold Bond Twinsulation! In fact, Twinsulation soon pays back its cost in fuel savings. More than that, you collect these savings every year. And your home is so much more comfortable... warmer in winter, up to 15° cooler in summer. Remember, too, only Gold Bond Twinsulation gives you fireproof rock wool with an aluminum heat-reflective covering on both sides—double insulating action. Twinsulation is easy to install—anyone can do it. Enjoy this extra year 'round comfort that actually pays for itself.

NATIONAL GYPSUM CO., BUFFALO 2, N. Y.

Send for complete How-To-Do-It Booklet on insulating your home... then see your Gold Bond dealer!



NATIONAL GYPSUM COMPANY
Dept. PM-114, Buffalo 2, N. Y.

Enclose 25¢ for "Home Insulation" booklet.

Name

Address

City.....County.....State.....

"No power. No pickup. All you have is gas mileage."—Niagara Falls, N. Y., draftsman.

"Would like split windows with no-draft vents. Gets awfully windy at 60 with windows down."—Berwyn, Ill., accountant.

"Gearshift sometimes locks in third."—Nashville, Tenn., owner.

"Windshield wipers too noisy. Motor is under dash, should be in engine compartment."—Aberdeen, Wash., cook.

"Folding top could be improved. Boot does not fit right."—Buffalo, N. Y., photographer.

"Panel light reflects on windshield."—Revere, Mass., schoolteacher.

"Can't lock both doors from inside."—Tonawanda, N. Y., accountant.

"Tread should be two inches wider. Can't drive on usual hoists for service. Have to go where they have fork-type lift."—Villa Park, Ill., salesman.

"Rattle in steering column somewhere. All of them have this."—Shreveport, La., contractor.

"Too rough riding on city streets."—Springfield, Mass., salesman.

"Both doors should have a key lock."—Reno, Nev., telephone operator.

"No room in rear seat with top down."—Staten Island, N. Y., cashier.

"Back window slants too soon so an adult can't sit in back."—Vineland, N. J., electrician.

Is Trend to Bigger Cars Wise?

"There is no need for 100 horsepower and over to transport one or two persons."—Bayville, N. Y., estimator.

"Trend to larger, more powerful and complex automobiles is wasteful of resources, it aggravates overcrowded highways and increases danger of fatal accidents."—Concord, Mass., engineer.

"Too many large cars are 'driving' the people."—Stormville, N. Y., public-relations man.

"Too much size and power gives driver too much confidence; omnipotent feeling. Makes showoffs speed-happy as well as reckless."—Clayton, Mo., engineer.

How Would They Change Metro?

We asked the owners what one change they would make on their cars.

"Remove rear passenger seat and make trunk accessible from outside."—West Patterson, N. J., superintendent.

"Make top slightly higher and longer so adults could sit in back."—New Orleans, La., physicist.

"Make back seat roomier or eliminate it."—Newfield, N. Y., technician.

(Continued to page 248)

Ask for a ROCKWELL-BUILT
DELTA SHOP

for a Christmas of a Lifetime....



Other Delta Gifts from 50¢ to \$200

There's a complete line of individual Delta Tools—all of them ideal Christmas gifts. You could ask for a circular saw, jointer, drill press, sander, band saw, scroll saw, shaper or lathe.

Or—ask for the Delta accessory you've been wanting for the Delta Tool you already own. See your Delta Dealer (he's listed in the classified pages of your phone book under "TOOLS" or "MACHINERY"), or write for catalog for Delta Power Tool Division, Rockwell Manufacturing Company, 502-L North Lexington Avenue, Pittsburgh 8, Pa.

**...So easy to get
 "A-Tool-At-A-Time"**

Here's the "do-it-yourself" power tool most men really want—the Rockwell-built DELTASHOP—the only combination tool made up of full-size power tools and arranged in the natural woodworking sequence—the only one motor combination tool you can buy either complete (as shown at left) or through the sensible "Tool-At-A-Time" Plan.

Here's How Easy **DELTA SHOP**
 "Tool-At-A-Time" Plan Works

1 Start with the precision-built Homecraft 8" Circular Saw—
PACKAGE #1 (Homecraft 8" Tilting Arbor Circular Saw and Stand)** Only \$109.80*



2 Next add the Homecraft 4" Jointer—
PACKAGE #2 (Homecraft 4" Jointer) Only \$49.15*



3 Then add the Homecraft 11" Drill Press—
PACKAGE #3 (Homecraft 11" Drill Press) Only \$57.50*



4 Now, get the Homecraft Disk Sander—
PACKAGE #4 (Homecraft Disk Sander) Only \$17.55*



5 Finally, the new Homecraft Saber Saw for cutting intricate curves—
PACKAGE #5 (Homecraft Saber Saw) Only \$14.95



DELTA QUALITY MAKES THE DIFFERENCE

*prices slightly higher in western region **motor extra



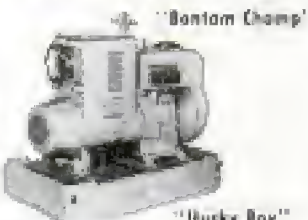
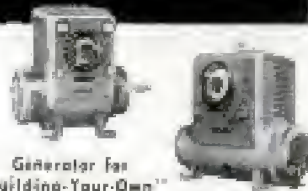
DELTA QUALITY POWER TOOLS

Another Product by

Rockwell

Make Big Money Arc Welding

with these
**LOW COST
HOBART
WELDERS**



New AC Welder has Remote Control

The new 300 Amp. AC Transformer welder lets you handle the profitable jobs. Easy to operate and ideal for production or all types of general repair work. New convenience features plus finger-tip Remote Control, at no extra cost. **Generator only for "Building Your Own" portable gasoline engine driven unit that gets**

quickly to the outside emergency repair jobs. Operates independent of power lines. Low investment — big profit maker. "Husky Boy"—light weight, air cooled gas engine driven welder, perfect for equipping a light weight service truck, for outside or around the shop welding. Handles the big pay jobs.

Let HOBART HELP YOU EARN MORE!

Hobart welders will help you earn more—start you in a profitable business of your own—built to give longer, more dependable service at low initial cost. Check the coupon for information that will start you on your way to earning more money.



HOBART trains you quickly!

You can learn arc welding quickly by actual on the job experience at the non-profit Hobart Trade School. Complete or partial courses. G.I. approved. Check coupon for free booklet.

HOBART BROTHERS CO., BOX M-114

TROY, OHIO, Phone 21223

"One of the world's largest builders of arc welding equipment"

Clip this Coupon!

HOBART BROTHERS CO., BOX M-114, Troy, Ohio

Without obligation send information or items checked below:

- AC Welder "Build-Your-Own" Generator
 "Bantam Champ" "Husky Boy"
 Hobart Trade School Welding Lessons, \$1

Free
Welder's
Vest Pocket
Guide

NAME _____

ADDRESS _____

CITY _____

STATE _____

"Should have overdrive."—Issaquah, Wash., engineer.

"Needs fourth speed forward. Can't get in trunk with top down."—Mt. Vernon, N. Y., attorney.

Of the mechanical troubles that the owners mentioned in their responses to the questionnaire, the most frequent was windshield-wiper trouble. Then came brake trouble, especially complaints about squealing. Other complaints concerned the carburetor, oil and grease leaks, inoperative turn signals and shift linkage sticking.

But despite complaints, owners were enthusiastic about their cars. Never have we received such a large percentage of returns on the questionnaires. Never have we had so many comments written on the blanks. In other words, the Metropolitan owners know their cars and they love this tiny import bearing the Nash nameplate.

Turn back to page 119 for Floyd Clymer's road test of the Metropolitan. ★ ★ ★

Clymer Road Tests The Metropolitan

(Continued from page 119)

Roadability is surprising and after a few miles you seem to forget you are driving a small car. There is some bottoming on hard bumps and some noise from the shock absorbers, but the ride is excellent. Quick-action steering (2-2/3 turns lock to lock) and the short wheelbase makes the car easy to corner. The narrow tread and overall length makes it desirable for congested traffic and small parking spaces.

For an 85-inch-wheelbase car, it has an amazing amount of leg and head room. Three persons can ride in the front seat, although somewhat crowded. The back seat is narrow and fine for small children, but is not comfortable for adults.

The Metro will cover about the same distance on one fill of its 10½-gallon gasoline tank as larger cars with double the tank capacity. Regular gas is satisfactory.

Styling is pleasing from front to rear and the hood has an air-scoop decoration that is not functional. The instrument panel is plain but practical. Warning lights indicate low oil pressure or a noncharging generator. The electrical system is 12-volt, an excellent feature that is becoming more common on American cars.

Fuel gauge and speedometer (the only dials on the dash) are easy to read with no horn ring to obstruct vision. Speaking of horns, the Metro has one that sounds more like a five-ton truck than a light car. Directional signals are controlled by a switch

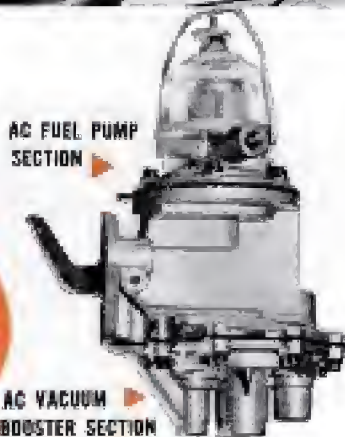
(Continued to page 250)

THIS CAR HAS **WIPER SLOW-DOWN**

...WHEN YOU  CLIMB HILLS...  OR STEP ON THE GAS



THIS CAR HAS AN **AC BOOSTER PUMP!**



Accelerate, climb hills, pass other cars on the road—wiper slow-down is no problem when you have an AC combination Fuel and Vacuum Booster Pump! This hazard of the road need be a hazard no longer.

Insist on an AC combination Fuel and Vacuum Booster Pump on any new car or truck you buy—or have one installed on the one you are now driving.

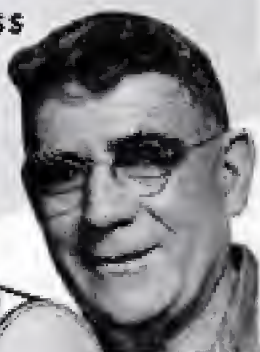


AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

FREE PLAN

Tells How to Start
Your Own Business

FILING SAWS



Saws come
from 20 and
30 miles

"I started a two-car garage and busy all the week I run do. Some days I start dirt in the morning. I get work 20 and 30 miles from my place of business."
—Charles H. Straub

Files Thousands of Saws
in Spare Time

"I have done 4 or 5 thousand saws in my spare time in the 4 1/2 years since I got the outfit, and they are all coming back with repeat orders."
—Len Grege

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business that pays up to \$3 to \$5 an hour, and you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings more customers. S. M. Hollingshead wrote to us: "I am doing very well with my Foley Filer, and I am glad I invested in your machinery. It is very satisfactory and works very well in the small community in which I live."

You can file all hand saws, also band and crosscut circular saws on the Foley Saw Filer. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. "The first saw I sharpened with my Foley Saw Filer came out 100%. I think it is a marvel of perfection."
—writes Clarence E. Parsons.

"**MONEY MAKING FACTS**" explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think—with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Get the facts—send coupon today for this practical, money-making plan. No salesman will call.



Send for **FREE BOOK**

FOLEY MFG. CO., 1116-4 Foley Bldg.,
Minneapolis 18, Minn.

Send me free book "MONEY MAKING FACTS"

Name _____

Address _____

on top of the horn button. A temperature gauge would be worth-while—there is none. The pull-type starter switch, ignition key and light control are all operated by the right hand. The ash tray is on top of the instrument panel. Radio speaker is in the center. The radio is below average. The glove compartment has no lid and is about big enough for a good-size pair of gloves. The rear-view mirror is well located, although the glass seemed to be of poor quality, distorting rear vision.

The front-seat cushion is foam rubber with leather and nylon upholstery. Vinyl plastic is used for door trim, side panels and rear-seat upholstery. A rear tire mount carries the spare outside the trunk as there is no exterior opening into the luggage compartment. Luggage must be loaded from inside the car. Most owners would prefer a luggage compartment operating from outside and so would I.

Vision is exceptionally good, front and rear. All four fender tips are easily seen by the driver. Three and a half turns of the crank open the windows. Doors open and close easily. Only the right door can be locked from the outside. This is bad because in a parking lot another car may drive so close that it is difficult to use the right door.

The brakes are hydraulic, internal-operating Girling (an excellent British make). There are several other British characteristics about the car as it is built in England for Nash.

The brake-pedal pressure is rather hard, but I found no evidence of fading even when abusing the car around winding mountain roads and turns. The pedal, however, is too small and is located too close to the clutch pedal and accelerator. The accelerator is an odd-shaped curved lever with a roller for the foot to press. It is not good as there is too much travel and Nash is already adding a conventional organ-type throttle pedal. This still does little to improve the arrangement because of the awkward foot angle.

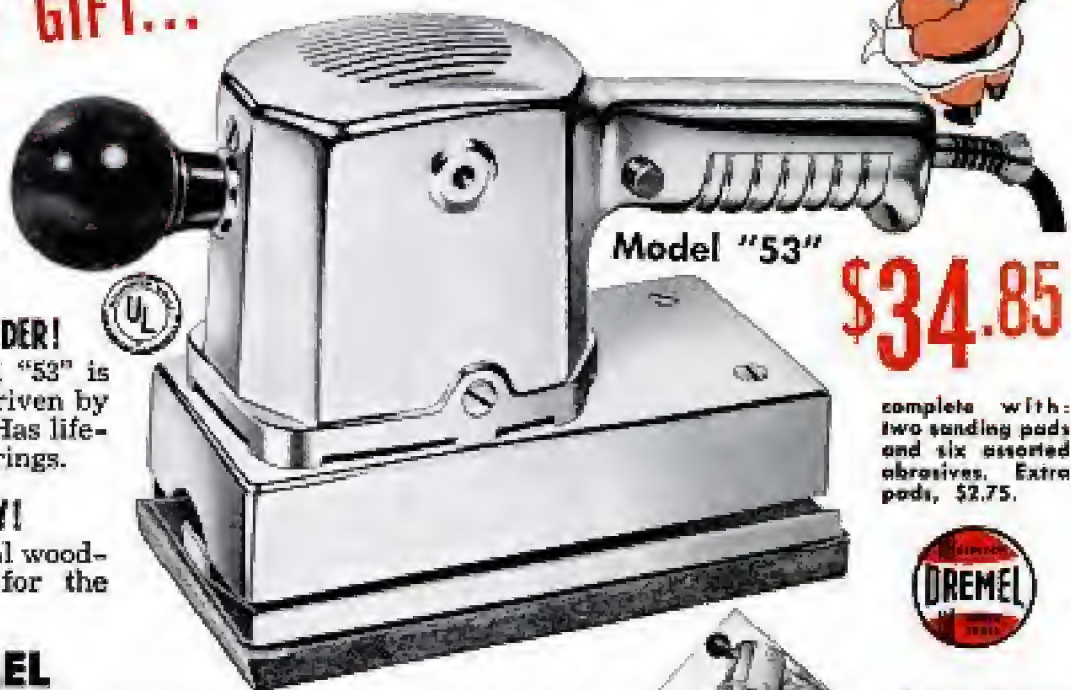
The body and chassis are welded as a unit, a feature of all Nash cars. This does help eliminate rattles and squeaks and I found none in the test car which was waterproof also. There is a feeling of solidity about the well-built body.

I felt very safe in the car. Once one gets used to its characteristics, a small car is not so dangerous as some people seem to think. In fact, all owners answering our questionnaire said they felt safe in the car.

It may well be that Nash has started a new trend in American motoring. Perhaps the public is now getting ready to accept a small car—Nash is betting that it is. ★ ★ ★

GIVE A DREMEL STRAIGHT-LINE ACTION SANDER!

The PERFECT GIFT...
for PERFECT FINISHES!



Model "53"

\$34.85

● **SENSATIONAL NEW SANDER!**

The DREMEL Model "53" is a real powerhouse, driven by a real rotary motor! Has life-time sealed ball bearings.

● **HEAVY DUTY CAPACITY!**

Built for the industrial wood-worker yet priced for the handyman!

● **ONLY DREMEL**

offers you straight-line action in a big capacity, motor-powered sander. That's why the "53" is the choice of craftsmen in home and industry. The "53" has a big 24 sq. in. sanding pad, yet weighs but 5 1/4 lbs. Delivers 6,000 strokes per minute. Has no gears, belts, brushes or commutator to wear out. Use it for WET or DRY, coarse, medium or fine sanding. You'll get results impossible with other sanders costing many dollars more!

complete with:
two sanding pads
and six assorted
abrasives. Extra
pads, \$2.75.



Easy on! Easy off!
Only DREMEL
has it!

EXCLUSIVE!

DREMEL Model "53" has a quick-action detachable sanding pad. Extra pad furnished free.



Hobbyists . . . Craftsmen . . . Housewives . . . All Need a DREMEL Sander!

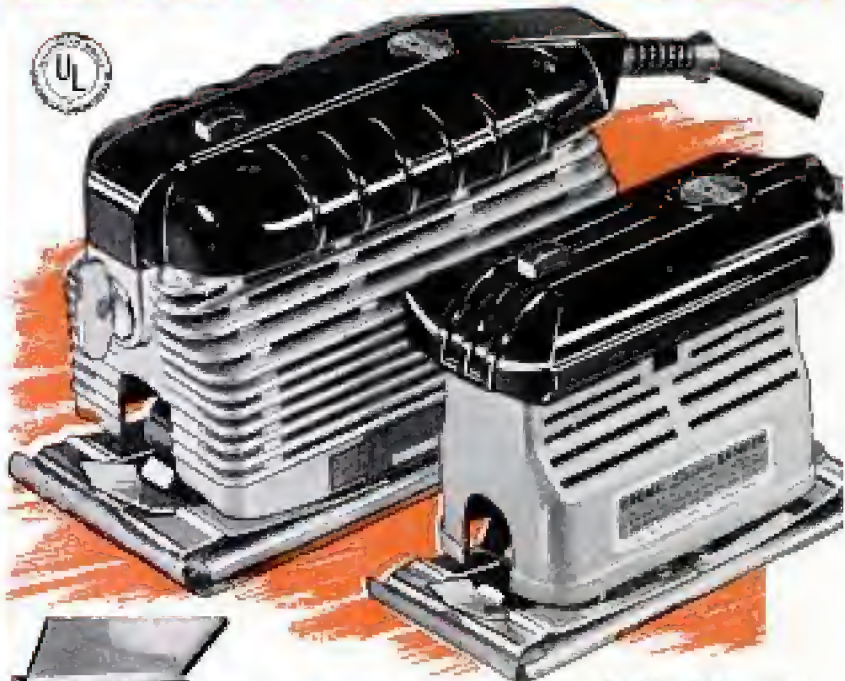
Did you know there are 4 different sanding actions? When choosing a power sander—it's the type of action that counts. To do the job right, you must sand with-the-wood grain. Sanding across-the-grain with a circular or orbital motion leaves scratches and swirl marks which show up after varnishing. Always remember — only DREMEL STRAIGHT-LINE ACTION will sand with-the-grain.

Proof that DREMEL Action Can't Scratch!

Of the four common sanding actions, only DREMEL sands 100% with-the-grain—the only guaranteed scratch-free action approved by finishing experts.

<p>ROTARY 18000- grain Action</p>	<p>ORBITAL 12000- grain Action</p>	<p>ARC (cross- grain) Action</p>	<p>DREMEL STRAIGHT- LINE (with-the- grain) Action</p>
--	---	---	--

SEE YOUR FAVORITE DEALER: Dremel Tools are sold at better dealers everywhere! If your dealer can't supply, order direct on a five-day trial, money-back guarantee. Return in full, and we will ship postpaid. Or, send only \$2.00 now, pay postman balance plus postage and C.O.D. fee.



DREMEL MODEL "2000" SANDER-POLISHER

Perfect for small shop use, home use, and workshop projects. Choice of craftsmen for fine finishing operations. Features Dremel "Straight-Line Action" 14,000 strokes per min.; 6 lb. wt.; 21 sq. in. (2 1/2" x 8 1/2") sanding surface. Model "2000" Sander-Polisher, 25 ass'd. abrasives, 1 polish pad in sturdy steel carrying case **\$24.50**

DREMEL MODEL "A" SANDER-POLISHER-MASSAGER

Lighter, snappy model, a favorite for general home maintenance, hobbycraft, furniture polishing, etc. Effective body massager. Features Dremel "Straight-Line Action" 14,000 strokes per min.; 2 1/2 lbs. wt.; 12 sq. in. (2 1/2" x 5 1/2") sanding surface. Model "A" Sander-Polisher-Massager, 6 abrasives, 1 polish pad, 1 massage pad **\$14.85**



DREMEL MANUFACTURING COMPANY, Dept. 114-L, Racine, Wisconsin



Piston rings wear out, too!

You can't see the wear on your piston rings. But you can feel it—in your engine's loss of power—and in your pocketbook.

At the first symptom of power drop-off or oil-pumping, you should go to your motor specialist for a ring check-up.

Wasted oil costs money. Needless repairs cost more. Both can be avoided by replacing the piston rings at the first symptom of ring wear.

Hastings rings are especially designed for replacement service. They deliver the lubrication that older motors must have—but always with complete oil control.

Don't gamble with the power that is built into your engine. Restore it, keep it, enjoy it.

If your motor specialist recommends new rings, ask him to install a Hastings Steel-Vent replacement set. Truly the best money you can spend on your car!

HASTINGS MANUFACTURING CO. • HASTINGS, MICHIGAN
HASTINGS LTD., TORONTO
Piston Rings, Casite, Oil Filters, Spark Plugs

HASTINGS

STEEL-VENT PISTON RINGS

Regular or Chrome



TOUGH on Oil-Pumping
GENTLE on Cylinder walls

Are the V8s All Alike?

(Continued from page 142)

up. Studebaker, Ford and Mercury are doing very well with solids.

At the other end of the valve train there are some interesting features. For instance, Ford Motor Company V8s (Ford, Mercury and Lincoln) have special features to prolong valve life. Low-friction valve-spring retainers are used that permit the valves to rotate freely as they move up and down; this greatly reduces seat deposits and wear. Furthermore, to promote valve cooling, they don't use separate guide bushings; the valves run directly in the iron cylinder heads—and this reduces valve-head temperatures over 200 degrees Fahrenheit. All the other V8 builders use conventional "solid" valve retainers and separate guides.

Ignition and Carburetion

Ford has done some pioneering in spark-advance control, too. All the other makers use a combination of manifold vacuum and engine speed to control the spark advance on the road; a linkage operated by centrifugal flyweights in the distributor advances the spark as the engine speed increases, and a diaphragm connected to the manifold operates another linkage to advance or retard the timing according to the load on the engine. Works good.

Ford has apparently found a simpler and less expensive way to do it. On the new Ford, Mercury and Lincoln V8s there is just a diaphragm linkage, and this is connected to the manifold vacuum and the carburetor throat (venturi). Manifold vacuum is proportional to load and venturi vacuum depends more or less on revolutions per minute; the combination of the two is put to work to handle spark advance over the full operating range. What could be simpler?

Whether to use a two or four-barrel carburetor is pretty much a question of your performance requirements. The hotter jobs—the large Chrysler, Oldsmobile, Buick, the big Studebaker, Cadillac, Lincoln and Mercury—use the big \$65 quads. DeSoto, Dodge, small Buicks, Ford and Studebaker Commander use the two-barrel carburetors. Any of these latter engines, however, could jump 10 percent in horsepower overnight with a quad installation.

To me, one of the most interesting features about the four-barrel carburetors is a special gimmick to control the two secondary barrels (used only by Buick). All the other engines open the secondary barrels according to manifold vacuum or throttle position. When you floor the throttle

(Continued to page 254)



\$35,000 REWARD FOR URANIUM

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Precision Geiger Counters and Scintillators are the finest instruments made for URANIUM prospecting. These highly sensitive instruments are compact, lightweight and ruggedly built for field use. Prices start at \$29.95.

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WORLD'S LARGEST MANUFACTURER OF PORTABLE RADIATION INSTRUMENTS

AT ALL HARDWARE STORES

FULLER'S "SCREW HOLDER"

SCREW DRIVERS

NOW! do the job at HALF THE COST!

- Spring clip holds and sets screws tightly!
- Reaches those "out of the way" spots!
- In 2 1/2", 3 1/2", 4 1/2" and 5 1/2" lengths — ONLY 30c
- Also 4" Phillips type! (3 1/2" x 3/16" blades)
- Hi Carbon Blades! • Unbreakable Amber Handles!

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LAWN ORNAMENT-NOVELTY PATTERNS

25 Lawn Ornament Patterns, 25c. Other Patterns: 15-20" high Dutch Girl, Dutch Boy, Pleasa, Bull Terrier, Mexican Girl, Mexican Boy, Dwarf, Penguin, Flower Girl, 15c each. 25 Novelty Patterns, 30c. All 4 1/2 Full Size Patterns, \$1.00.
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HARDWOOD LEGS FOR "YOU-MAKE-IT" FURNITURE

Solve problem of leg strength!

Laminated to shape—nut bent. Take any finish. Easy to make useful, beautiful modern furniture with simple, ordinary tools. 4 sizes for you cut in sizes: 1 1/2" x 10", \$2.50; 2" x 10", \$4.00; 2 1/2" x 10", \$7.50; 3" x 10", \$7.80. Send for set of 4 legs today—satisfaction guaranteed. Or get catalog of complete kits of furniture. Prices F.O.B. Send one-half cash or money order—balance C.O.D.

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Write for complete information!

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Insure now against Anti-freeze loss and engine overheating

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To prevent costly spill-over and boil-away, clean out your radiator *before* adding anti-freeze. Du Pont Cooling System Cleanser gets rid of rust, scale and grease quickly, safely, surely. No reverse flushing necessary.



2. PREVENT LEAKS AND SEEPAGE WITH DU PONT COOLING SYSTEM SEALER

Your cooling system may *seem* watertight, yet still have tiny pinholes through which permanent anti-freeze can "creep." To eliminate the threat of this wasteful seepage, simply pour Du Pont Cooling System Sealer into your radiator. It finds and closes the holes . . . can't clog or harm hose or metal parts.



ASK ABOUT THE COMPLETE DU PONT PRE-ANTI-FREEZE SERVICE at your service station or car dealer today and insure trouble-free driving this winter.

DU PONT No. 7. PRODUCTS
From Chemical Research . . . For Easier Car Care



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Radioactive
Tracer Tests
Prove . . .



PYROIL "A"

reduces top cylinder wear **40%**

These results were achieved by one of America's most reputable independent oil laboratories using the most modern radioactive scientific instruments in a series of tests which compared wear on top piston rings with and without Pyroil "A" added to *premium grade gasoline* . . . Pyroil "A" in a *continuous* test reduced wear 40%. In normal stop and go driving the value of Pyroil "A" as a *top engine* lubricant would be even more evident!

HERE'S WHY!

Pyroil "A" contains an agent possessing a high polar attraction for metal, so it clings strongly to all metal surfaces. Pyroil is also strongly attracted to all which means that it actually *holds* oil to the metal. Thus when two metal surfaces slide together the oil is not squeezed out nor will it drain or wash off.

Pyroil "A" lubricates valve stems and upper engine parts not properly lubricated by crankcase oil. Rust proofs entire exhaust system.



PYROIL "B" Crankcase Additive
Reduces Wear 17% when used
with premium or heavy duty oils

Another test by a petroleum laboratory shows a 17% reduction in engine wear when Pyroil "B" is added to one of the top grade heavy duty oils, due again to its polar attraction creating a thin film of an extreme oiliness nature which will not drain off, wash off or squeeze off. Keeps hydraulic valve lifters free—makes starting easier!

The Perfect Pair for Motor Care

Pyroil "A" complete upper engine lubrication only 25¢

Pyroil "B" complete crankcase treatment only 79¢

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NEW
40°
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PYROIL frostfree "A"
— Gasoline Anti-Freeze
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Sold by leading gasoline stations, garages and automotive stores in Canada, Cuba and most foreign countries. Write for descriptive literature.

PYROIL COMPANY, INC., 279 PYROIL BLDG., LACROSSE, WISCONSIN

at very low speed all four barrels pop open and you've got too much carburetor capacity; mixture distribution gets sluggish and the torque output may be less than with only two barrels. On the Buick carburetors a special valve system keeps the rear barrels closed off, even with full throttle, until the engine air-flow demand actually exceeds the capacity of the primary barrels—something around 1500 revolutions per minute. Throttle response at low speed is improved. It's the only logical way to regulate a four-barrel carburetor.

Well, anyway, I think you'll agree that, even though our new V8s may look pretty much alike from the outside, you've really got plenty to choose among. Which will it be for you? ★ ★ ★



Fast-Acting Core Drill Cuts Holes in Concrete

Water and a cutting compound are used in a vertical drill that cuts through concrete, stone or glass. Speedy, quiet and dustless, it can be used in occupied buildings to cut holes for conduit, water and service lines, and for anchoring machinery of any size. When the drill gets dull, it isn't sharpened on a grinding wheel—a common hacksaw regrooves it in three minutes. A new drill costs about one tenth as much as the usual carbide-tipped drill. The machine drills a core of one to six inches in diameter at the rate of ¼ to ¾ inch per minute. No experience is required to operate it. Maximum depth of the hole is 18 inches.

POWER HYDRAULICS for SNOW PLOWS

Use on



TRUCKS

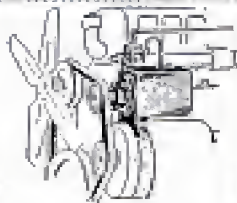


JEEPS



TRACTORS

HY-LO-JACK
does
the job
**FASTER -
EASIER**



- Lifts average snow plow in 3 to 10 seconds.
- 1,000 lbs. per square in. pressure
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PICTURE-BASEMENT WINDOWS • SCREEN DOORS & SCREENS

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FOR WOODWORKERS only 25c**

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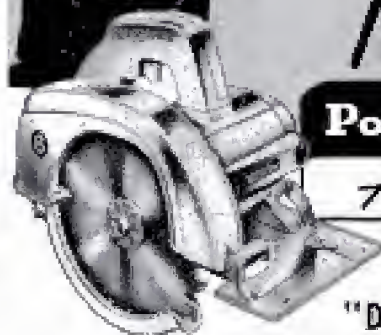


Buy the things you
want with the money
you save using this...

New

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"DO-IT-YOURSELF"

ELECTRIC SAW

Convert your attic yourself and save up to \$500!
Build a basement gameroom and save as much as
\$400. Save around \$50 on wooden lawn furniture!

Men whose tool experience is limited to screwdrivers and hammers find this an extremely easy saw to use. It was built for amateurs — but built in such a way they'll still be using it when they're "experts."

First and foremost, it's safe. The Kick-Proof Clutch (only one of its kind) prevents the blade from kicking out of the cut when you hit hard knots. And the protective telescoping guard always covers the exposed teeth, whether the blade is whirling or at rest.

It's a powerful saw with a big 9 amp. motor. Comes with a 6" combination blade that makes any cut you want — long rips, fast cross-cuts, shallow or deep grooves, narrow or wide angles, tricky bevels. Has ball bearings throughout. Installs on a saw table (accessory) for double usefulness. Fully guaranteed by manufacturer.

Remember, the money you'll save
with this saw will pay for the things
you thought you couldn't afford!

Only **49⁵⁰**

- Mail-coupon for specifications, pictures, etc.

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2451 N. Salina St., Syracuse 8, N. Y.
In Canada: Strongridge, Ltd., London, Ont.
Send illustrated literature on Model 125 "Do-It-Yourself" Electric Saw . . . also address of store where I can examine one.

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\$2.49



FAST, ACCURATE, EASY BORING

You'll be amazed at the ease of boring holes from 1/4" to 1" in wood, panel board, plaster, plastic or composition — to say nothing of the price. Best-Bore Bits make clean, true holes — at an angle, into end grain or for mortising. Also ideal for hard to reach places and for boring overhead.

Bits — 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", chrome-plated shank packed in handy plastic case, complete with instruction leaflet and tightening wrench. Your hardware dealer can supply, or send money order for \$2.49.

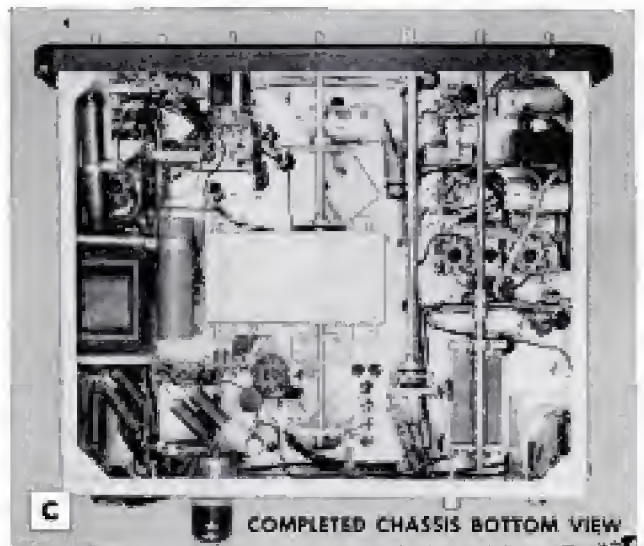


Buy the **Parker** Line

SNELL DIVISION

PARKER MANUFACTURING CO.

WORCESTER 1, MASS., U. S. A.



COMPLETED CHASSIS BOTTOM VIEW

CW and Phone Transmitter Kit

(Continued from page 160)

Johnson model 122 VFO kit, and it is extremely stable. The separately calibrated bandspread-dial scales for each of the seven bands, and the efficient 6 to 1 planetary-dial mechanism, provided exceptional tuning accuracy with smooth control when tested under actual operating conditions. The 65-watt phone with 100 percent modulation and pi-network antenna load matching from 50 to 500 ohms will please any ham. Excellent break-in keying stability for CW is accomplished by light loading, voltage regulation and careful circuit design. The kit is available from all radio-parts houses.

Photos B and C show top and bottom views of the completed chassis. Wiring harness, which greatly simplifies assembly, is supplied. All parts, hardware and connectors, are furnished in the kit which includes the chassis base, cabinet and all shields which are formed and punched. No drilling or other metal work is necessary. The 18-gauge steel cabinet measures 15" x 11 3/16" x 9". Photo D shows a view of the meter-shield and TVI-filter assembly.



SHOP by MAIL and SAVE at GROBAN'S

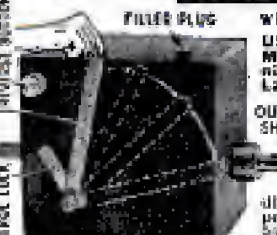
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BRAND NEW - MULTI PURPOSE HYDRAULIC PUMP OR MOTOR
NEW MANUFACTURE
ITEM #55 Silent, high efficiency, Helical Gear Type Ball Bearing Hydraulic Pump or Motor. Based 8 Gal. Per Min. At 1200 R.P.M. - Delivers 1000 P.S.I. Using 3 H.P. - Reversible Rotation - 3/4" Pipe Thread Inlet and Outlet Ports - 1/2" Drain Port - 3/4" shaft with keyway and flut for either direct or pulley drive. Dimensions - 3 1/2" high 7 1/2" long 2 1/2" wide. Shipping weight 12 lbs. P.O.B. Chicago. **45.50**




GROBAN HYDRAULIC SPEED REDUCER
WITH FINGERTIP CONTROL
ITEM #115 1 1/2" x 1 1/2". Gov't acquisition cost \$428.00. Ship. wt. 3 1/2 lbs. Complete with 2 qts. of oil and full instructions. P.O.B. Chicago. **54.50**



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OUTPUT SHAFT Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 3/4 to 1 1/2 H.P. Shafts 3/4" diam. Input rotation counter-clockwise. Output shaft, Input speed 1500 R.P.M. 7 1/2" x 1 1/2".

A. C. ELECTRIC GENERATOR
ITEM #G-75-G
 —7 1/2 K.W. single phase, 110/220 volt output. 3 wire system, 2 bearing construction. 6 groove 6" V belt pulley included. Self-excited. Foot mounted. Drive generator from tractor or stand by engine. Ample power for 6 room house. Dimensions: 34" x 11 1/2". Shipping Wt. 420 lbs. P.O.B. Chicago. **295.00**



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ITEM #210—3 1/2" bore, 11" stroke. Alloy steel cylinder wall. Micro Honed and all steel 1 1/2" diameter piston rod. 1500 overall length closed. Clevis mounting at base and end. Will use 1000 lbs. with 1000 P.S.I. Pressure. Uses 3/4" tubing fittings. Fittings to pipe thread: two 3/4" NPT & 3/4" & 3/4" 100.00 value. Shipping weight 11 lbs. P.O.B. Chicago. **25.00**



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Now Only 44.45 complete
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The Complete Kit

For — • Dumping farm wagons • Adjusting depth of plows • Hydraulic Press • Hydraulic Jack • Snow plows.

KIT CONSISTS OF:

- 1—Brand new Blackhawk Model P-152—Hydraulic hand pump with built-in oil tank and release valve. Rated from 1800 P.S.I. to 8000 P.S.I. 2 1/2" handle. Dim. 8" x 6" x 7" Item #22. **22.50**
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All necessary hydraulic fittings. Total ship. wt. —40 lbs.

COMPLETE KIT PRICE, \$44.45
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- ALL STEEL CONSTRUCTION
- 8" BORE—15" STROKE
- DOUBLE ACTION
- 50,000 LBS. PRESSURE WITH 1000 P.S.I. PUMP OUTPUT.
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200 GALLONS Per Minute

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- Home Water Systems • Dewatering

For high volume commercial, home and industrial use. Standard 2 1/2" pipe thread inlet, twin 1 1/2" pipe thread outlets. Ball bearing supported 3/4" shaft. Easy priming. Rotation, counter-clockwise facing shaft. Gov't. acq. cost \$145.00. Complete with full instructions. Ship. wt. 35 lbs. P.O.B. Chicago. **39.50**

Will deliver 200 gals. per min. against 65 ft. head using 3.2 H.P. at 3500 R.P.M.



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200 GALLONS Per Minute

- For Draining Basements • Fire Fighting
- Irrigation • Fuel Transfer • Swimming Pools
- Home Water Systems • Dewatering

For high volume commercial, home and industrial use. Standard 2 1/2" pipe thread inlet, twin 1 1/2" pipe thread outlets. Ball bearing supported 3/4" shaft. Easy priming. Rotation, counter-clockwise facing shaft. Gov't. acq. cost \$145.00. Complete with full instructions. Ship. wt. 35 lbs. P.O.B. Chicago. **39.50**

Will deliver 200 gals. per min. against 65 ft. head using 3.2 H.P. at 3500 R.P.M.

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ITEM #126—Four-way open center control valve with built-in adjustable relief valve factory set at 1000 P.S.I. Spring loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. Has 3/4" pipe thread inlet and outlet. 1/2" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10 1/2 lbs.

AN OUTSTANDING BUY!
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PARK MAGNETS, PM-11, 1557 GREENBAY RD., HIGHLAND PARK, ILL.

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CRAFTSMAN

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Carbide Tipped Saws

Now Save Up to
\$262 until
 Dec. 31st

ONE OF THESE SAWS

—a 10-inch blade in actual service—sawed more than 27 miles of 3/4-in. laminated Masonite without resharpening, until damaged by a steel object

8-inch
 Was \$8.75

\$7.77

Compare these LOW LOW Sale Prices

Sears introduced this special design saw less than 3 years ago. Since then we have consistently sold these top quality blades at prices lower than any other saw blade manufacturer. Now, during this sale, until December 31, we are again cutting our regular low price.

Tungsten carbide tipped—hardest metal known! Special steel saw blade is heat treated. Teeth are ground with diamond wheels to exacting tolerances to give faster, smoother, more efficient cutting; less vibration; less noise. Needs less resharpening. Rips, cross-cuts, misers. Cuts all woods, plastics, Formica, aluminum, abrasive building materials, wallboard, etc. NOT for masonry, steel or other ferrous metal.

Prices reduced at your nearest Sears Retail Store!

Diam.	Arbor Hole	Fits These Saws	Price
5 7/8 in.	1 3/16 in. diamond	6-in. Skil-saw elec. hand saw...	6.66
6 in.	1/2 in. square	Mall; DUNLAP elec. hand saw...	6.66
6 in.	5/8 to 1/2 in. round bushed arbor	Porter-Cable electric hand saw; bench saws	6.66
6 1/2 in.	1 1/8 in. round	6-in. Black and Decker	6.66
6 1/2 in.	1/2 in. round	CRAFTSMAN 6 1/2-in. electric hand saw; bench saws	6.66
7 in.	5/8 to 1/2 in. round bushed arbor	Bench saws	7.33
7 in.	1 3/16 in. diamond	Skil-saw and Sears former Q2186 electric hand saw	7.33
7 in.	1/2 in. square	Mall electric hand saw	7.33
8 in.	5/8 to 1/2 in. round bushed arbor	CRAFTSMAN 8-in. electric hand saw; bench saws	7.77
8 in.	1 3/16 in. square	Mall electric hand saw	7.77
8 in.	1 3/16 in. diamond	Skil-saw electric hand saw	7.77
8 in.	1 3/8 in. round	Black & Decker elec. hand saw	7.77
10 in.	1-3/4-3/8 in. round bushed	Bench, builders', radial, and swing saws	8.88
12 in.	1-3/4 in. round bushed arbor	Radial saws, swing saws, and bench saws	14.88



1/2 or 13/16
in. square



1, 1 1/4, 1 3/8
in. round



1/2, 5/8, 3/4
in. round

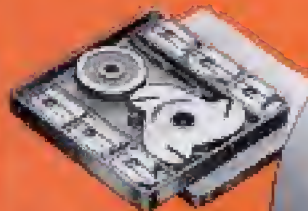


1 3/16 in.
diamond

Big Price Cuts!

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**Molding
 Cutter Set**
 Separate Prices
 Total \$19.95 **\$9.95**



Plastic Storage Box included with each set. Has six compartments for cutter bits . . . compartment for molding head

You get Molding Cutter Head and 6 Cutter Bits Sets Shown. Seventeen cutter bit sets available at Sears stores



Convert your Bench Saw to a Jointer-Planer and Shaper

We want you to share with us the tremendous savings offered in this molding cutter set. By special arrangement with our manufacturer we can again offer this amazing Molding Cutter Set at our **LOW SALE PRICE** during the months of November and December. We know of no comparable set selling at anywhere near this low price. Go to your nearest Sears Retail Store and see it for yourself. It saves lumber costs, and it saves time. Sale priced until December 31, 1954.

Number of Designs are Unlimited! You are actually limited only by your imagination. Cutter bits are made from special heat-treated tool steel; 1 inch wide. Vertical slot in back of blade assures alignment in molding head. Six different cutter bit sets included as shown above: (A) 3 Bead (1/4 in.) cutter; (B) 1-in. Planer and Jointer; (C) Glue Joint Cutter; (D) 1/4 and 1/2 in. Quarter Round Cutter; (E) Quarter Round and Cove Cutter; (F) Base Mold Cutter. In plastic box, with wrench, spacer washer and bushings.

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 Famous for fine quality . . . precision performance . . . low price!

New Christmas
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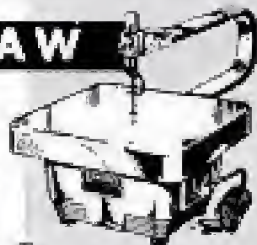


Santa urges you to send for Syncro's FREE Gift Guide of new Electric Do-It-Yourself jig saws and sanders! Get or give dependable Syncro performance, quality, durability at rock-bottom cost. Mail coupon for Free Guide, Low Prices!

NEW JIG SAW

Yes... it cuts 2x4's

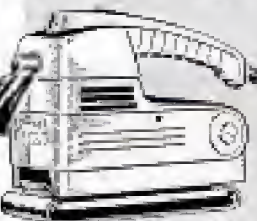
Basic homeshop tool... for making home repairs, lawn furniture, planters, toys, intricate designs, etc. New Syncro 2008 is the only self-powered jig saw to offer YOU all this: (1) cuts 1-3/4" wood; (2) cuts to center of 30" circle; (3) 100 sq. in. working surface; (4) Safe for all the family; (5) Motor guaranteed against burnout; (6) Cuts smooth edge—no splintering; (7) same blade cuts wood, plastic, metal, brass, leather, etc.



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Grooved Wire Holds Lenses In Place Without Drilling

Snap-on half-rims that hold eyeglass lenses firmly in place without screws which pierce the glass have been developed by a Geneva, N. Y., optical manufacturer. The lenses are held in place by plastic-lined, deeply grooved wires on either side of the top sections. Spring action of a crossbar just behind each lens top provides necessary tension to grip the lenses.

"Hedgehog" for Kitchen Sink Removes Stains From Cups

Bristling like a porcupine, a new kitchen aid has rubber spikes that remove lipstick, stains and grease from coffee cups. The cup washer, developed in England, consists of seven brushes covered with rubber bristles. A suction cup attaches it to the sink, which is filled with soapy water to the tops of the brushes. The cup then is inverted over the center brush and moved up and down to remove all dirt and stains.



Just dropping a hint to Ford owners

FALLING LEAVES are rustling out the message that right now is the time to have your Ford "winterized." Then you'll know it's ready to take on winter's roughest weather.

For one thing, you'll want your ignition system gone over . . . and, if new spark plugs or battery will step up its performance, insist on Genuine Ford Spark Plugs and Battery. You'll also want to have your cooling system protected with Genuine Ford Anti-freeze, permanent or regular.

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Always remember that you can depend on Genuine Ford Parts because they're made to specifications set by the same men who originally built your Ford.

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Address _____

City _____ Zone _____ State _____

Our Navy's Mightiest Carrier— USS Forrestal

(Continued from page 85)

ship afloat. "Her flight deck overhangs the hull 60 feet on each side," engineers point out. "She's the only ship on which crewmen can come aboard under cover when it rains. It's like walking in under a theater marquee."

The extra width has other advantages. Look down from the outboard side of the island and you'll see flight crews spotting landed planes on a wide strip of deck well out of harm's way. No other carrier has deck space big enough to take planes behind the island. From here, tractors haul them on broad aprons back to the bow for relaunching, or to one of the ship's four monster elevators, capable of lifting 70,000 pounds each.

All this while, on the bow, Demon fighters have been rocketing into the air—tossed skyward by revolutionary catapults that can ram the biggest jets into the air at well over 100 miles per hour. As each plane roars down the slot, it is followed by a small geyser of hissing steam, for these are steam "cats"—another British brainstorm (*Popular Mechanics*, March 1953). Here's how they work: Steam from the ship's boiler expands behind a huge piston in the "cat," and sends it slamming down a cylinder the length of a football field. The plane, attached to the piston by means of a bridle that pokes up through a slot in the cylinder wall, goes with it. A tricky "Zipper" valve, extending the length of the slot, lets the bridle slip down the slot, but closes up behind it to keep the high-pressure steam from escaping. By the time it hits the end of the cylinder, that piston—and the plane—are moving at incredible speed. The piston is braked abruptly in a long tube of water at the cylinder's end, while the plane soars away at flying speed up above. So powerful are these "cats" that jets can be launched when the *Forrestal* is dead in the water—or even downwind. The ship has four of them—two off the bow and two on the port side, amidship.

The jets with folded wings that you see disappearing below the flight deck on the big outboard elevators are being wheeled out, below, into a hangar deck reminiscent of Mammoth Cave. Twenty-five feet high and running the entire length of the ship, it is a tumultuous melee of engines and planes undergoing repair and maintenance, tractors wheeling here and there towing folded-wing jets to tie-down position. Here, men work at the largest fuel-blending

(Continued to page 264)



Do-It-Yourself . . . Do More . . . Do Better

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Take this folding rule. Only the inches are like other rules. Even these last longer. The sticks are extra thick and plastic coating protects the markings against wear. 8 in. brass slide extends 6 inches either end, or may be removed to measure where rule won't fit. Rule opens to even numbers . . . folds to convenient marking gauge for even inches from 2 to 12. Ask for Stanley "100 PLUS" No. X226. \$2.75.

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Inspect this screw driver. Here's a tool that deserves inspection . . . that'll stand it. This is a professional tool, used for years by craftsmen in industry, in the home shop. It does more than drive screws. With this "Yankee" you drive and draw one hand, thanks to ratchet action and quick-return handle. It's fast and easy. Ask for "Yankee" Spiral Ratchet Screw Driver No. 130A. \$7.70 (Includes three different size bits).

Look for Stanley and "Yankee" when you look for fine tools. Use coupon for free catalog.

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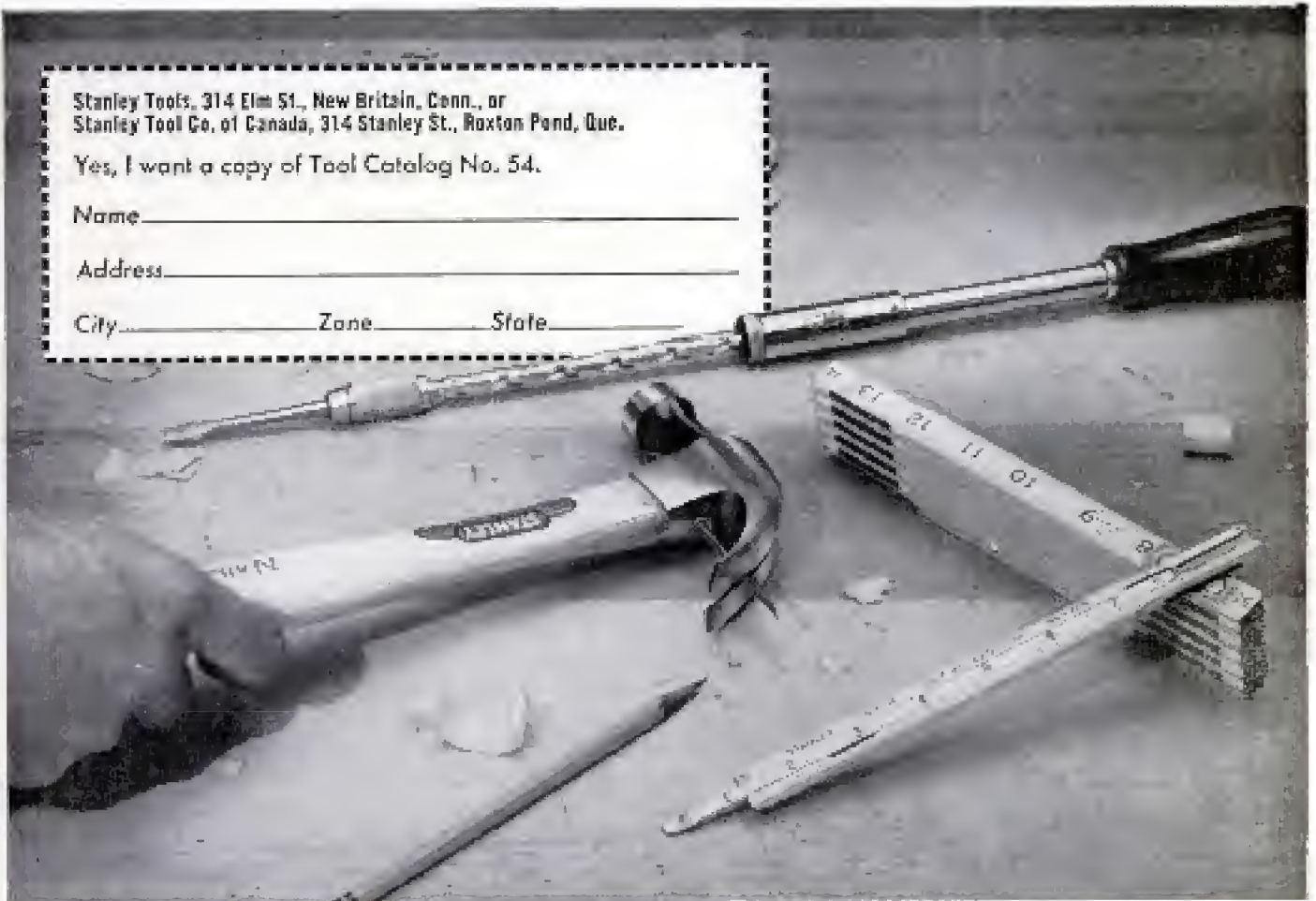
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Stanley Tool Co. of Canada, 314 Stanley St., Roxton Pond, Que.

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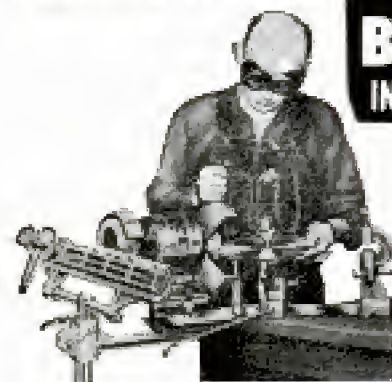
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BUSINESS
IN YOUR SPARE TIME**



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Smith gives me big
profits at low ex-
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35 to 40 circular
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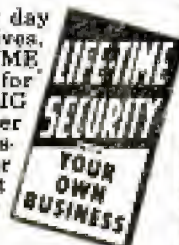
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machine on any carrier — mixing gasoline with oil to produce the cheaper concoction that jet engines gulp at a prodigious rate 3 to 10 times greater than World War II fighters used. There may be a crew of men at the vast quarter-deck opening—bigger than the foundation hole of a three-bedroom house—grouped around a hose constrictor of a refueling hose stretched across water to a heaving tanker alongside. The *Forrestal* can refuel from either side.

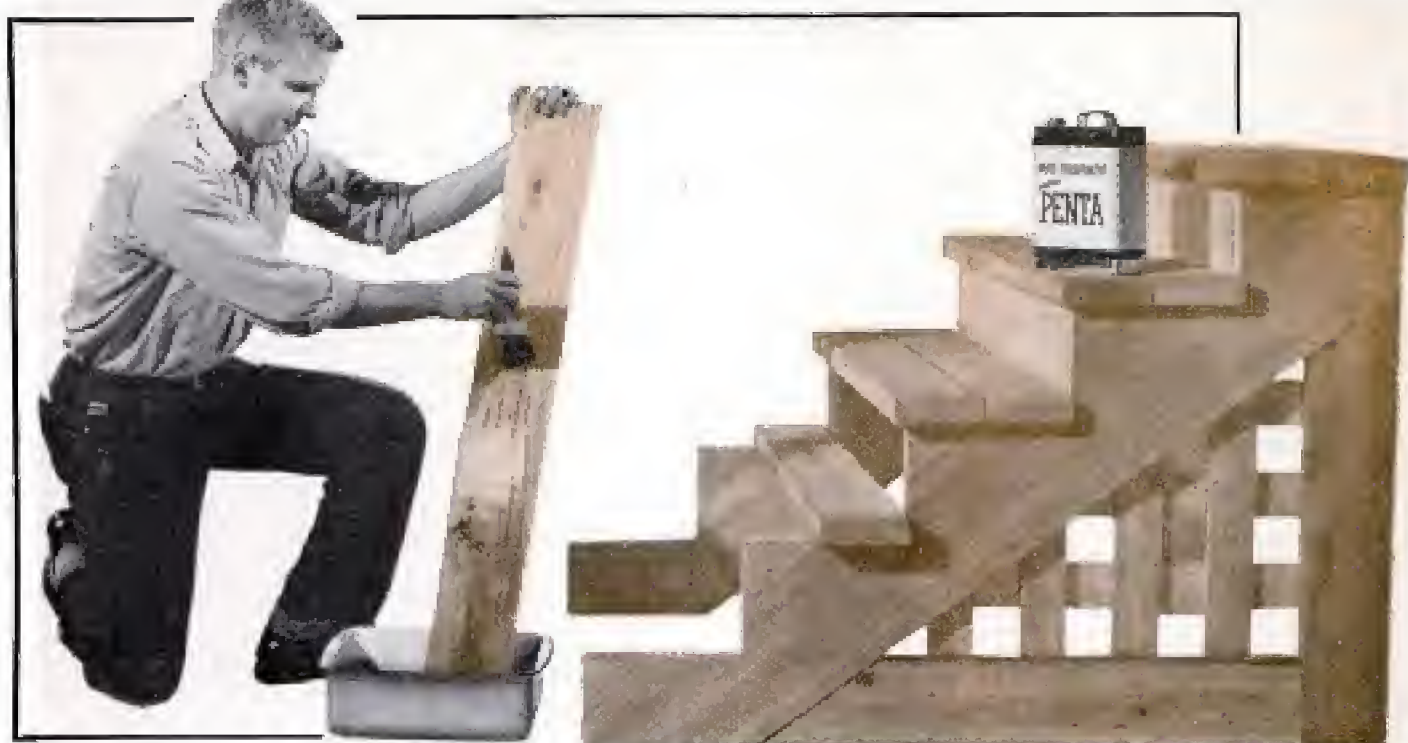
The heads and shoulders of goggled, space-suited men you see gliding upward behind the hangar-deck bulkhead are no hallucination. They are jet pilots heading for the flight deck via escalators—an innovation on carriers, and not just to pamper the pilots. "The ready rooms," say Navy experts, "where pilots sit in leather chairs for briefing—under red light for night missions or white light for daytime sorties—are at hangar-deck level. When he leaves for his plane, the average jet pilot is lugging nearly 100 pounds of gear. If he were to double-time up four flights of steps, he'd be soaked with perspiration—all set to court pneumonia at the rarefied sub-zero temperatures to which his jet will carry him in a few minutes."

Actually, no ship ever had such facilities and comforts as the *Forrestal's* 3500-man crew will enjoy. You see sailors descending broad stairways to air-conditioned quarters. Each has an individual Pullman-type bunk with reading lamp and air-conditioning ventilator. Those bunks in the gallery-deck areas even have foam-rubber mattresses. The men in skivvies, with towels over their arms, have no obstacle hike to the showers because every berthing area has its own—just as each has its own mess and recreation room, with easy chairs and writing tables all done in soft color schemes. "These are not just luxury either," Navy engineers point out. "Men get lethargic when they work in a hot steel box all day. Experts have found that air conditioning and good recreation and sleeping quarters makes for greater efficiency—and that pays off."

The gallery deck on a carrier is the space between the hangar-deck overhead and the flight deck. It's a tricky structure on the *Forrestal*, for besides housing officers and berthing areas, it holds the ship together. On most flat tops, the flight deck is merely an appendage laid atop the ship itself. Under the *Forrestal's* flat top a row of 10-foot-high steel beams spans the ship like a row of joists in a flat-roofed house. The hangar-deck's steel overhead is a complete "gallery deck" hung on the underside of

(Continued to page 266)

clean *PENTA*-treated wood won't rot!



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Give your home repair projects, or anything you build with wood, the same *protection* against destructive rot and termites that big builders and architects favor. Clean PENTA* preservatives penetrate deep into wood, bringing longer-lasting resistance to decay and insects to save you costly replacement or repairs.

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Ask your local hardware or lumber dealer for a brand-name wood preservative containing *PENTACHLOROPHENOL in either a water-repellent or regular type. And for money-saving suggestions on how to use PENTA wood preservatives to best effect, mail coupon today for your free copy of Dow's helpful "Handyman's Guide to Home Wood Preservation." THE DOW CHEMICAL COMPANY, Midland, Michigan.



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Midland, Michigan

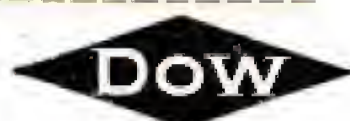
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these big girders. The flight-deck plates sit on top of them. Forrestal crew members will live and work in the spaces between the girders like mice scurrying around the ceiling spaces of a house.

The rooms you see with nozzles jutting from the overhead are "drenching rooms." Every damage-control area has one for prompt scrub-down of personnel in case of atomic attack. If you have any doubts about the atom-age features of this push-button ship, they're soon settled by the spaghetti-like nightmare of conduits, cables and pipes you see weaving down the passageways in a vast incomprehensible tangle. Some of the gadgets they serve would put Buck Rogers in the gaslight era.

No naked eye can see the signals the *Forrestal* flashes from the big lamps on her signal bridge. Their infrared light is invisible and can only be picked up with special equipment. Automatic features in her engine spaces are so complete that engines can actually run themselves for hours in case men are forced out by high temperatures or smoke during action. "Boilers and blowers," engineers will tell you, "operate without being touched by human hands."

Although it would take a still uninvented supertorpedo to penetrate the *Forrestal's* top-secret hull structure (so designed that torpedo shock is dissipated and can't inflict inside damage), the ship is back-stopped by the most streamlined damage-control system afloat.

Imagine yourself in the weird damage-control center deep in the ship's bowels. It's a room lined with tiny lights that stud the bulkheads like plugs in a switchboard. Suddenly the carrier shudders under the impact of a hit. Here's what happens—faster than you can follow. A tiny red light flashes red on the big board, indicating exact location of the emergency. Via intercom, the operator quickly learns from men in the area just what the damage is. Flipping his rotary switchboard, he alerts the damage-control crew in that area. Within seconds, men swarm in to handle the damage. During battle, this may happen in a dozen places at once, but terse messages flying in and out of damage-control keep everything moving like clockwork.

Even more fantastic are the five-inch-gun emplacements on each quarter of the ship. Their Mark 56 directors do everything but bury the victim. "Suppose," says one Navy expert, "ship's radar picks up an enemy plane. Immediately the bridge alerts fire-control crews on the guns. They turn Mark 56's search radar on target location, flip a switch and that's that—scratch one plane."

The incredible Mark 56 brain, with its

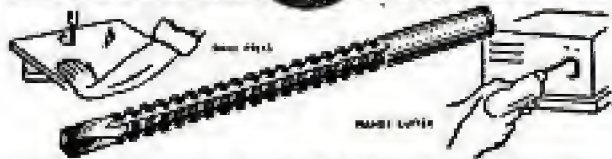
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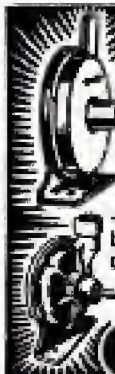
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SWEDESBORO T., NEW JERSEY

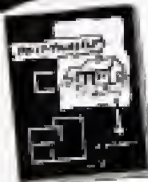
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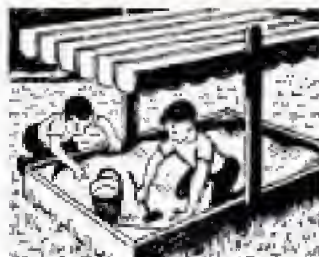
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glowing tubes, humming condensers and clucking relays, pin-points the target via its search radar's electronic eye, which can pierce the blackest, foggiest night. In split seconds, electron beams flash signals through the nightmarish equipment. Automatically wind, lead, ship's degree of roll are calculated and fed into the machine's maw by itself. Gun directors whir and big barrels swing skyward automatically, eerily tracking the invisible target across the sky. When the target is within range, the brain knows it. It waits until the ship rolls into proper position—and then lets go! Missiles with electronic fuses fly upward to demolish the victim with almost foolproof accuracy. That's not all. The guns then automatically eject their empty shell, automatically load themselves and automatically track and fire at other targets they have automatically discovered, while the crew sits back and fans itself. "Though we don't do it," the Navy admits, "it's possible to operate these turrets without men in them."

It takes plenty of ingenuity to build a ship like the *Forrestal*, and men at the Newport News Yard can set your head reeling as they recount some of the problems they faced and solved.

Gordon Donnan, of the steel-hull division, will show you how the giant cranes are being forced to back off toward the bow as the flight-deck overhang goes on. "Those 60-foot sponsons come out over crane tracks and everything," he points out. "That means we had to install everything—shafting, propellers and heavy machinery—before we could move forward. Once the overhang is up those cranes can never go back again."

Special hot shops had to be built on the piers to work her oversize plates. Welders wore special asbestos shoes to work on her plates while they were still hot—because of her new steel alloys requiring new welding techniques.

Though the yard's massive cranes can lift 75 tons with controls so fine that a full load can be raised or lowered a fraction of an inch, they couldn't heft the *Forrestal*'s mighty 166-ton elevators. So these were built in a near-by shipway for "launching" into position, where combinations of barge cranes could hoist them into place. Huge sponsons for the ship's mushrooming flight deck had to be fabricated right alongside the place they were going. They were too heavy to move around.

Weight of the *Forrestal*'s mighty chunks are a standing joke among the men, and many a piece the size of a city apartment

(Continued to page 270)



AIR COMPRESSOR

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Original Gov. Cost \$350.00

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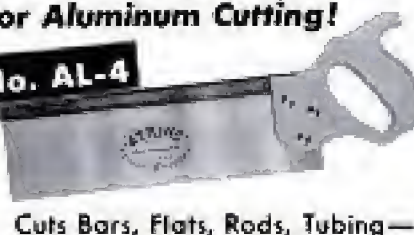
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| <p>—COMPRESSOR—</p> <ul style="list-style-type: none"> • Mfg. by BENDIX WESTINGHOUSE • Twin cylinder • 4 Rings on each piston for added compression—capable of pumping 1100 lbs. p.s.i. • Forced pressure lubrication assures oil to every moving part • Ball bearing construction • Capacity 5.3 cu. ft. | <p>—ENGINE—</p> <ul style="list-style-type: none"> • Mfg. by BILGERS & STRATTON • Kick or rattle alarm • 2 H.P., 4 cycle air cooled • Splash lubrication system • 245, 228 tank • Float feed carburetor with adjustable idle speed and automatic governor • 3 Piston rings |
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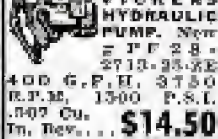
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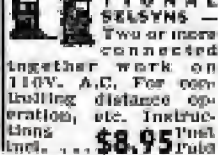
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house bore a sign that quipped: "Not to be moved by hand."

Plenty of odd things can happen on a ship the size of the *Forrestal*. Walter Deal of the yard's steel-hull division recounts with gusto how one welder went down in the endless maze of chambers in the *Forrestal*'s underbottom to check a tank and got lost. "When the welder turned up missing at time-card check that night, we sent a search party through the underbottom," Deal explains. "They found the man all right. He'd beaten his flashlight to pieces, pounding the bulkheads trying to make enough noise to attract attention."

With all the problems, the mighty *Forrestal* is on schedule—and that's some achievement when you know that nearly 2000 railroad cars of materials from every corner of the country had to be carefully fitted in just the right place; that 50,000 tons of steel went into her; that four miles of blueprints a day for 20 months were required in her plans; that her 14,000 working drawings kept 700 draftsmen busy for three solid years.

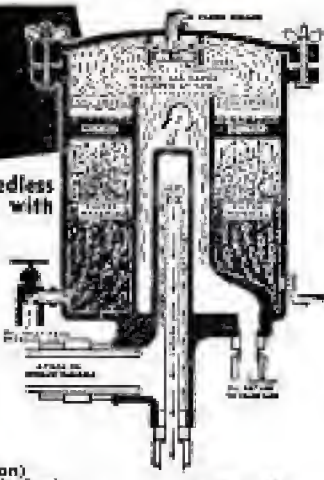
But things learned the hard way on our new atom-age carrier will help pave the way for a whole fleet of floating monsters. Already the *Forrestal*'s sisters are in the making. The *Saratoga*, same size and shape, is due off the Brooklyn Navy Yard ways next year. And in 1956 the third CVA, *Ranger*, will float out of the same graving dock as the *Forrestal*. Right now, the *Ranger*'s hull plates are going down in a dock beside her eldest sister. The dock is much too small for her, but construction is timed so that when the *Forrestal* is launched this month, *Ranger* will be far enough along to be floated out of her crib and into a grown-up bed that will take her growing hulk. ★ ★ ★



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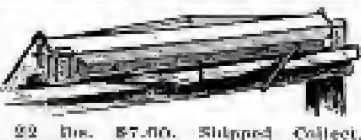
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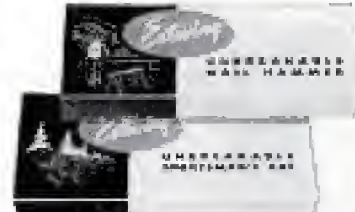
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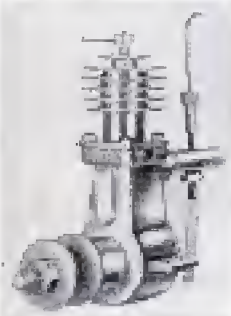
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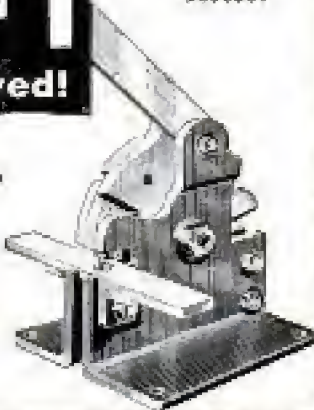
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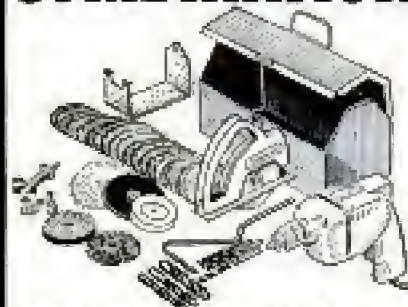


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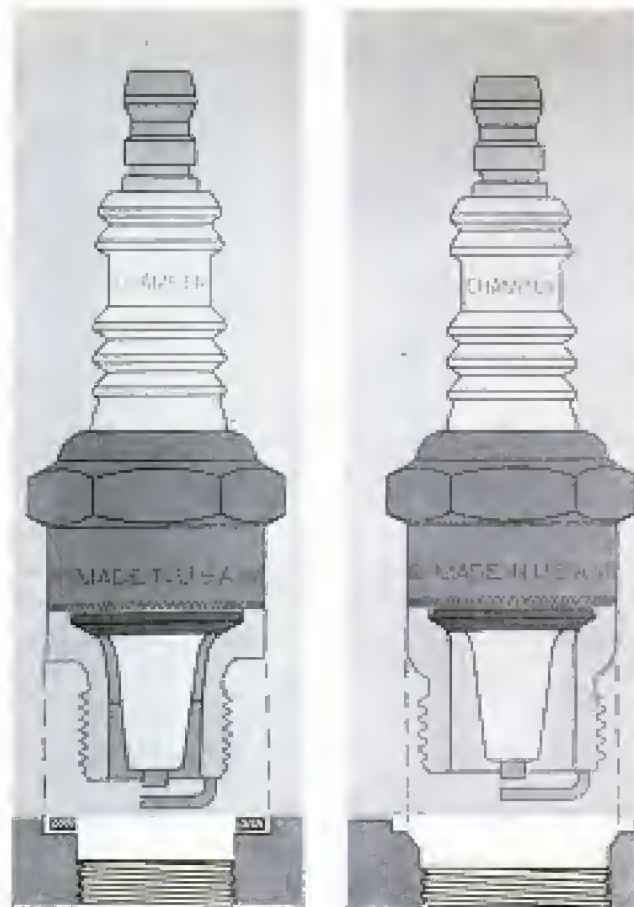
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Chemical May Kill Red Tide

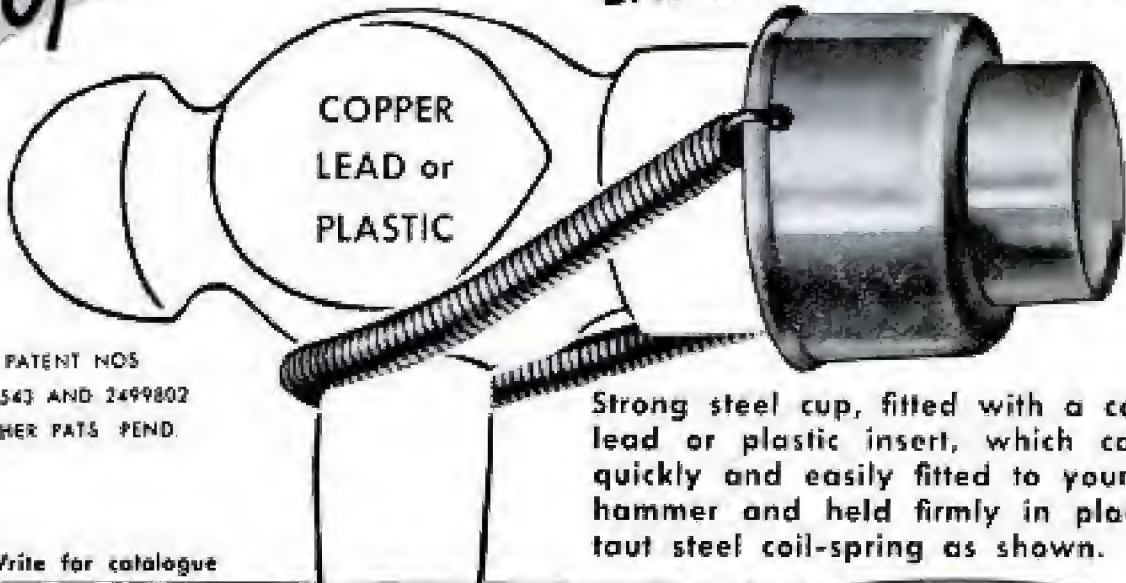
Airplanes may dust the ocean along the west coast of Florida with activated charcoal to destroy the red tide. The red tide is caused by thousands of one-celled organisms which color the water, cluster together in massive red-tinged "blooms" and create a poison which litters the beaches with thousands of dead and dying fish. The activated charcoal, it is believed by University of Florida researchers, would absorb the hormones and vitamins needed by the organisms for their life processes. The cost would be considerably below the copper sulphate now being used effectively.

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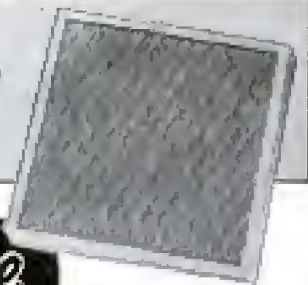
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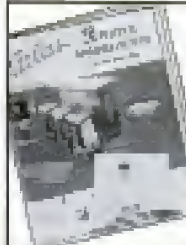
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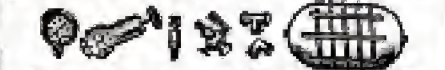
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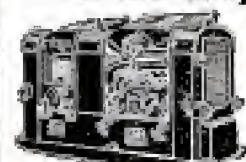
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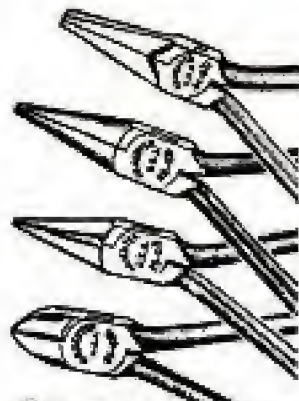
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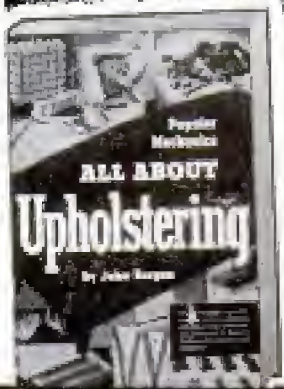
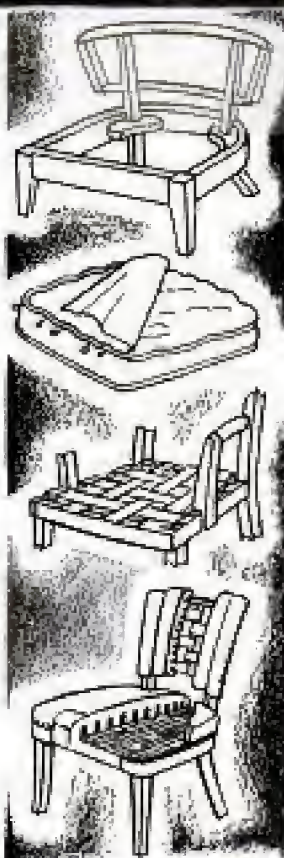
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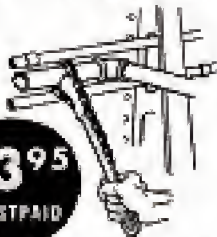


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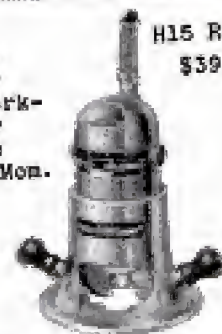
I could do more of the jobs you ask me to do if I had any one of these Stanley electric tools. So you see, I'm really not asking for myself.

With this swell drill kit, built around the 4" drill, I could do lots of things faster and easier. Look at all that's in it.

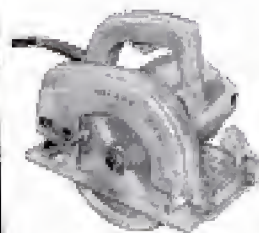


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\$44.95**

Fred says I can use this Stanley Router in 90% of my woodworking. I could really use it to help make your new cabinets, Mom.



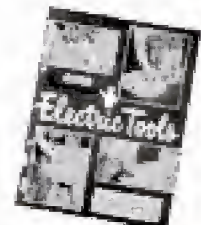
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\$39.95**



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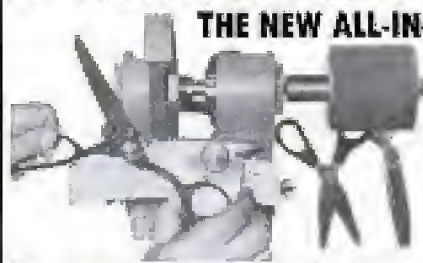
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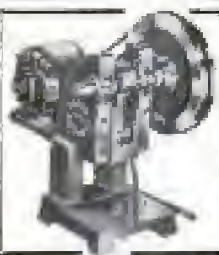
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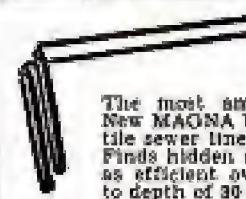


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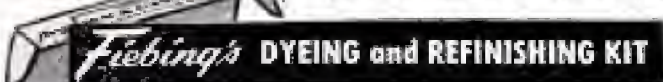
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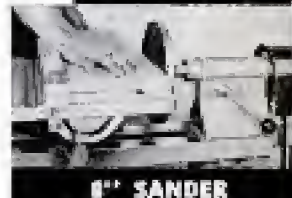
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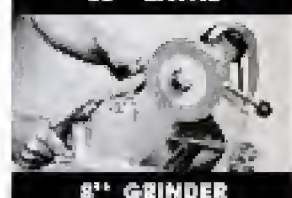
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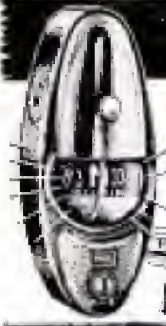


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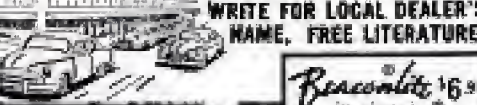
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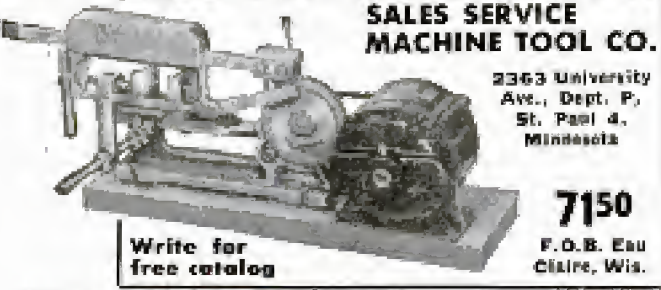
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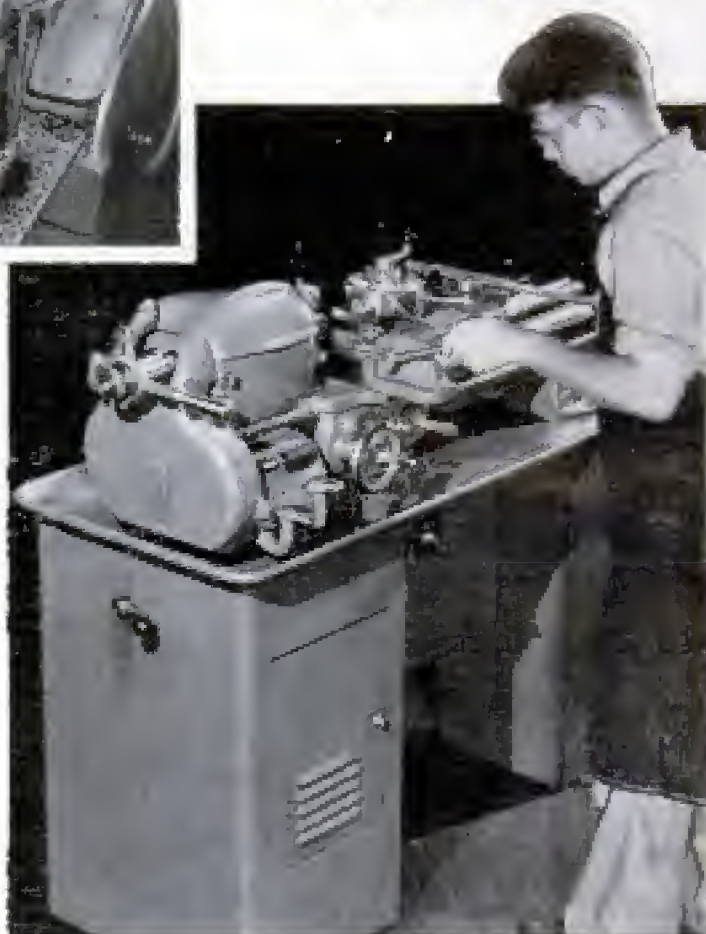
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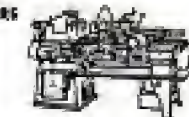


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Detroit's Biggest Problem

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THEORETICALLY, YOUR ENGINE should never wear out, because the moving parts never touch each other. They're always separated by a thin film of oil. The problem is to keep abrasive particles out of that thin film of oil. That problem has become tougher every year since the Model T, as engine clearances have become finer and speeds higher.

Today, abrasive particles comparable to the thickness of the ink on this page may do hundreds of dollars of damage to your engine!

Because hot oil, under pressure, often forces "channels" in rag or paper filter packs, these abrasives get through. That's why a team of researchers developed a new material for oil filters: porous bronze.

This new filter material is made of millions of microscopic balls fused together. No amount of oil can force a channel in it. No dangerous abrasive particles can get through. It doesn't soak up valuable oil additives as absorbent filters do. *And you never change it!* You simply rinse it in gasoline and keep on using it for 10,000, 100,000 and more miles of driving. It's called the Life-Time filter.



The cost? About the same as a couple of throwaway filter packs. In addition to saving the cost of filter pack replacement, you save the quart of oil soaked up and thrown away with ordinary filter packs and — most important — you save money on engine repairs by filtering out dangerous abrasives.

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1. "Tin Can"



2. Rigid Cone



1. First crude attempts to design a bronze filter simply imitated the shape of the ordinary throwaway pack. Because of its basic structural weakness and the danger that sediment packing between the element and the case might critically reduce oil pressure, all attempts to "improve" this design were abandoned, even though it was relatively cheap to manufacture.

2. After considering almost every geometric shape, the cone was selected as the most rigid and was used for the Life-Time filter. This design also allows the sediment to drop to the bottom of the case, clear of the element. It has withstood the ultra-sonic vibration test and the 100G shock test. Only the Life-Time filter uses this exclusive cone design; it is fully protected by patents.

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For complete unit, including case (fits any car), send make, year and model of your car and \$12.95 (we pay shipping).

Conversion kit, which replaces your present filter pack with Lifetime bronze, is \$6.95 for most cars (send make and number of present filter when ordering). Conversion kits for Buicks with hydraulic lifters and for cars with full flow systems: \$13.95.

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Complete Lifetime Filter; fits any car.



Lifetime Conversion Kit; replaces ordinary packs with permanent bronze element.

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